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ABSTRACT

The training manual is one of a series prepared for enlisted personnel of the Regular Navy and the Naval Reserve who are training for performance proficiency and studying for advancement in the Aircrew Survival Equipmentman (PR) rating. The illustrated and indexed manual focuses on the personnel parachute and other related survival equipment. Instruction covers the following areas: (1) parachute inspection and familiarization; (2) work center arrangement; (3) parachute packing and rigging; (4) assemblies for NC-3, NB-11, NES-16A, and MBEU parachute types; (5) automatic parachute actuators; (6) parachute maintenance and repair; (7) sewing machines, (8) fasteners; (9) helmets and oxygen masks; (10) aircrew personal protective equipment; (11) liferafts and equipment; (12) carbon dioxide; (13) safety belts, shoulder harnesses, and helicopter rescue devices; (14) oxygen and related components; (15) rigid seat survival kits; and (16) NES-8B and drogue parachute assemblies. (MW)

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AIRCREW

SURVIVAL EQUIPMENTMAN 3 & 2

NAVAL TRAINING COMMAND

RATE TRAINING MANUAL

NAVTRA 10358-E

PREFACE

This Rate Training Manual is one of a series of training manuals prepared for enlisted personnel of the Regular Navy and the Naval Reserve who are training for performance proficiency and studying for advancement in the Aircrew Survival Equipmentman (PR) rating. It is based on the professional qualifications for advancement to PR3 and PR2, as set forth in the Manual of Qualifications for Advancement, NavPers 18068 (Series).

The manuscript for this training manual was prepared by the Navy Training Publication Center, Millington, Tennessee, a field activity of the Naval Training Support Command, for the Chief of Naval Training. Technical reviews were provided by personnel of the Naval Air Systems Command, Washington, D.C.; the Naval Aerospace Recovery Facility, El Centro, California; the Naval Air Development Center, Warminster, Pennsylvania; the Naval Aviation Integrated Logistic Support Center, Patuxent River, Maryland; the Aircrew Survival Equipmentman Schools, Lakehurst, New Jersey; and the Naval Examining Center, Great Lakes, Illinois.

1973 Edition

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THE UNITED STATES NAVY

GUARDIAN OF OUR COUNTRY

The United States Navy is responsible for maintaining control of the sea and is a ready force on watch at home and overseas, capable of strong action to preserve the peace or of instant offensive action to win in war.

It is upon the maintenance of this control that our country's glorious future depends; the United States Navy exists to make it so.

WE SERVE WITH HONOR

Tradition, valor, and victory are the Navy's heritage from the past. To these may be added dedication, discipline, and vigilance as the watchwords of the present and the future.

At home or on distant stations we serve with pride, confident in the respect of our country, our shipmates, and our families.

Our responsibilities sober us; our adversities strengthen us.

Service to God and Country is our special privilege. We serve with honor.

THE FUTURE OF THE NAVY

The Navy will always employ new weapons, new techniques, and greater power to protect and defend the United States on the sea, under the sea, and in the air.

Now and in the future, control of the sea gives the United States her greatest advantage for the maintenance of peace and for victory in war.

Mobility, surprise, dispersal, and offensive power are the keynotes of the new Navy. The roots of the Navy lie in a strong belief in the future, in continued dedication to our tasks, and in reflection on our heritage from the past.

Never have our opportunities and our responsibilities been greater.

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CHAPTER 1

AIRCREW SURVIVAL EQUIPMENTMAN (PR) RATING

Many men engaged in a great number of specialized fields are needed to maintain the Navy's air arm in a condition of constant military readiness. All of these specialists are mutually dependent, and each contributes his part to the efficient operation of the entire organization. An important member of this team of specialists, which keeps naval aviation the most potent force of its kind in the world, is the PR.

The PR has as his primary mission the business of saving lives, a mission equally important in peace and in war. One generally thinks of the aviator as trusting his life to the aircraft he is flying. However, if for some reason the aircraft becomes disabled, the aviator's probability of survival would be small–except for the equipment that the PR has provided for such an emergency. With this equipment, aviators and their crews are able to abandon their disabled aircraft, parachute to safety, and survive on land, at sea, or even in the arctic wastelands.

This training manual is designed with a twofold purpose: to help you meet the basic, or fundamental, skill requirements that must be acquired before you can become proficient in your job assignment; and to present detailed information, the knowledge of which is necessary in your preparation for advancement to pay grades E-4 and/or E-5. The Aircrew Survival Equipmentman qualifications which are used as a guide in the preparation of this manual are current through the latest revision of the Manual of Qualifications for Advancement, NavPers 18068 (Series).

Do not make the mistake of skimming through this chapter; details are included for your benefit. Examination questions may be taken directly from this text.

This training manual contains information and illustrations pertaining to the configuration, function, application, and maintenance procedures applicable for the use of personnel when performing organizational, intermediate, and depot levels of maintenance.

Only those procedures which are common, but not necessarily limited, to the included item of survival equipment appear in this manual. All other information which cannot, or does not, lend itself to a common procedure will be contained in the NavAir manual pertaining to the item.

Most of the maintenance and repair procedures discussed in this manual are limited to the actual performance only, and makes few specifications as to the type of material or part, sewing machine, thread, or stitch range to be used. Where this manual has not already done so, the NavAir manual pertaining to the item will make these specifications. NavAir technical publications are discussed later in this chapter under the heading, Sources of Information.

ENLISTED RATING STRUCTURE

The present enlisted rating structure consists of general ratings and service ratings.

General ratings identify broad occupational fields of related duties and functions. Some general ratings include service ratings; others do not. Both Regular Navy and Naval Reserve personnel may hold general ratings.

Service ratings identify subdivisions or specialties within a general rating. Although service ratings can exist at any petty officer level, they are most common at the PO3 and PO2 levels. Both Regular Navy and Naval Reserve personnel may hold service ratings.

PR RATING

The PR rating is a general rating and is included in Navy Occupational Group IX (Aviation). There are no PR service ratings.

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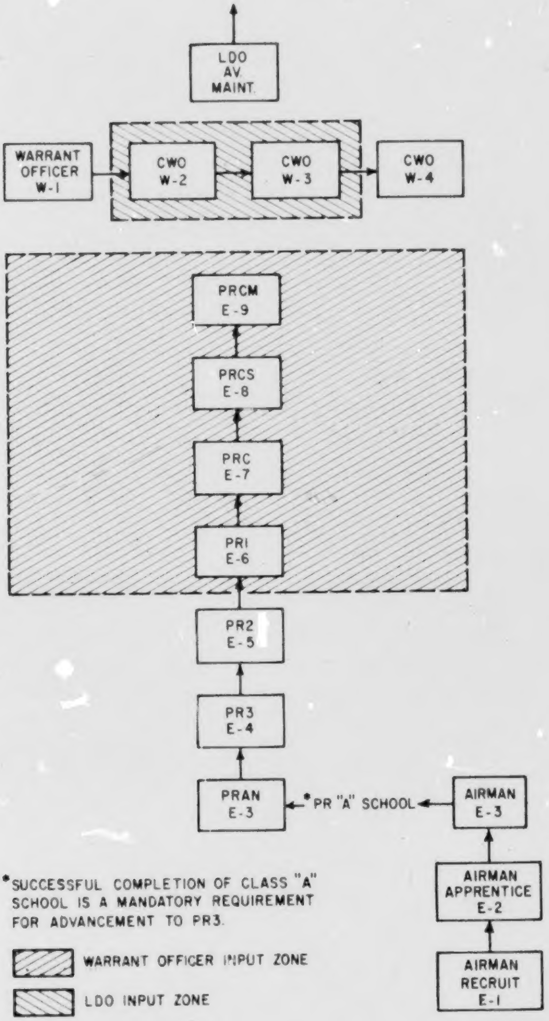
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PR.1

Figure 1-1.—Path of advancement.

Figure 1-1 illustrates the path of advancement from Recruit to Master Chief, Warrant Officer, or Limited Duty Officer. Figure 1-1 indicates career stages from which qualified enlisted men may advance to Warrant Officer (W-1) and selected Commissioned Warrant Officers (W-2 and W-3) may advance to Limited Duty Officer.

The Aircrew Survival Equipmentman (Class A) School, located at Lakehurst, New Jersey, is designed to provide PR strikers with the understanding and knowledge which leads to the fulfillment of the technical requirements for advancement to PR, Third Class.

An opportunity is provided to make one premeditated free-fall parachute descent, using a parachute rigged and packed by the student, under the supervision of a qualified instructor. This is on a strictly voluntary basis after the candidate arrives at the school.

PR "A" School candidates must have a combined "minimum" GCT, MECH, and SP (Shop Process) score totaling 156 or GCT and MECH of 105. However, when the GCT is taken alone, it should not be lower than 50. A three point waiver in each area tested may be authorized. Twenty-four months of obligated service from the date of entry at the school is required.

The Third Class and Second Class PR's have the following duties to perform:

Inspect, maintain, and repair parachutes, survival equipment, and flight and protective clothing and equipment. Pack and rig parachutes. Pack and equip rafts. Repair and test oxygen regulators, controllers, oxygen bailout bottles, and liquid oxygen converters removed from aircraft. Fit and maintain oxygen masks, flight clothing, antiexposure suits, and anti-g suits. Operate and maintain carbon dioxide and oxygen transfer and recharge equipment. Operate oxygen component test stands. Operate and make minor adjustments on sewing machines. Test safety belts and shoulder harnesses removed from aircraft. Assist in supervising the operation of parachute lofts, oxygen shops, and survival shops, and instruct personnel in the proper techniques of survival.

LEADERSHIP

As you advance to PR3 or PR2, more and more of your worth to the Navy is judged on the basis of the amount of efficient work you are able to obtain from the men under your supervision. The Secretary of the Navy has outlined some of the most important aspects of naval leadership in General Order Number 21.

Naval Leadership is the art of accomplishing the Navy's mission through people. It is the sum of those qualities of intellect, of human understanding, and of moral character that enables a man to inspire and to manage a group of people successfully. Effective leadership, therefore, is based on personal example, good management practices, and moral responsibility.

The Naval Leadership Program is a continuing program to develop those qualities of leadership, to the greatest extent possible, in all people within the Naval Establishment.

ADVANCEMENT

Some of the rewards of advancement are easy to see. You get more pay. Your job assignments become more interesting and more challenging. You are regarded with greater respect by officers and enlisted personnel. You enjoy the satisfaction of getting ahead in your chosen Navy career.

The advantages of advancement are not yours alone. The Navy also profits. Highly trained personnel are essential to the functioning of the Navy. By advancement, you increase your value to the Navy in two ways: First, you become more valuable as a person who can train others and thus make far-reaching contributions to the entire Navy; and second, you become more valuable as a technical specialist in your own rating.

HOW TO QUALIFY FOR ADVANCEMENT

What must you do to qualify for advancement? The requirements may change from time to time, but usually you must:

1. Have a certain amount of time in your present grade.
2. Complete the required Rate Training Manuals by either demonstrating a knowledge of the material in the manual by passing a locally prepared and administered test, or by passing the Nonresident Career Course based on the Rate Training Manual.
3. Demonstrate your ability to perform all the practical requirements for advancement by completing the Record of Practical Factors, NavTra 1414/1.
4. Be recommended by your commanding officer, after the petty officers and officers supervising your work have indicated that they consider you capable of performing the duties of the next higher rate.
5. Successfully complete the applicable military leadership examination which is required prior to participating in the advancement (professional) examination.

Remember that the requirements for advancement can change. Check with your educational services office to be sure that you know the most recent requirements.

Advancement is not automatic. After you have met all the requirements, you are eligible for advancement. You will actually be advanced only if you meet all the requirements (including making a high enough score on the written examination) and if quotas permit.

HOW TO PREPARE FOR ADVANCEMENT

What must you do to prepare for advancement? Advancement is not an overnight affair. One does not take the advancement examination and wake up in the morning in the next pay grade. There is a path or sequence of events which one must pursue. Certain things must be done or accomplished before one is admitted to the advancement in rate examination. You must study the qualifications for advancement, work on the practical factors, study the required Rate Training Manuals, and study other materials that are required for advancement. To prepare for advancement, you should be familiar with the purpose, use, and interrelationship of the following publications pertaining to the advancement process.

1. Manual of Qualifications for Advancement, NavPers 18068 (Series).
2. Record of Practical Factors, NavTra 1414/1.
3. Bibliography for Advancement Study, NavTra 10052 (Series).
4. Applicable Rate Training Manuals and their companion Nonresident Career Courses.
5. Examinations for advancement.

Collectively, these documents make up an integrated training package tied together by the qualifications. The following paragraphs describe these materials and give some information on how each one is related to the others.

"Quals" Manual

The Manual of Qualifications for Advancement, NavPers 18068 (Series), gives the minimum requirements for advancement. This manual is usually called the "Quals" Manual, and the qualifications themselves are often called "quals." The qualifications are of two general types: military requirements, and professional (or technical) qualifications.

Military requirements apply to all ratings rather than to any one particular rating. Military requirements for advancement to third class and second class petty officer rates deal with military conduct, naval organization, military justice, security, watch standing, and other subjects which are required of petty officers in all other ratings.

Professional qualifications are technical or professional requirements that are directly related to the work of each rating.

Both the military requirements and the professional qualifications are divided into subject matter groups; then, within each subject matter group, they are divided into practical factors and knowledge factors. Practical factors are things you must be able to DO. Knowledge factors are things you must KNOW in order to perform the duties of your rate.

The qualifications for advancement and a bibliography of study materials are available in your educational services office. Study these qualifications and the military requirements carefully. The written examination for advancement will contain questions relating to the knowledge factors and the knowledge aspects of the practical factors of both the military requirements and the professional qualifications. If you are working for advancement to second class, remember that you may be examined on third class qualifications as well as on second class qualifications.

It is essential that the "quals" reflect current requirements of fleet and shore operations, and that new fleetwide technical, operational, and procedural developments be included. For these reasons, the qualifications are continually under evaluation. Although there is an established schedule for revisions to the "quals" for each rating, urgent changes to the "quals" may be made at any time. These revisions are issued in the form of changes to the "Quals" Manual. Therefore, never trust any set of "quals" until you have checked the change number against an up-to-date copy of the "Quals" Manual. Be sure you have the latest revision.

Record of Practical Factors

Before you can take the Navy-wide examination for advancement, there must be an entry in your service record to show that you have qualified in the practical factors of both the military requirements and the professional qualifications. A special form known as the Record of Practical Factors, NavTra 1414/1 (plus the abbreviation of the appropriate rating), is used to keep a record of your practical factor qualifications. The form lists all practical factors, both military and professional. As you demonstrate your ability to perform each practical factor, appropriate entries are made in the DATE and INITIALS columns.

Changes are made periodically to the Manual of Qualifications for Advancement and revised forms of NavTra 1414/1 are provided when necessary. Extra space is allowed on the Record of Practical Factors for entering additional practical factors as they are published in changes. The Record of Practical Factors also provides space for recording demonstrated proficiency in skills which are within the general scope of the rate but which are not identified as minimum qualifications for advancement.

If you are transferred before you qualify in all practical factors, NavTra 1414/1 should be forwarded with your service record to your next duty station. You can save yourself a lot of trouble by making sure that this form is actually inserted in your service record before you are transferred. If the form is not in your service record, you may be required to start all over again and requalify in the practical factors which have already been checked off.

A second copy of the Record of Practical Factors should be made available to each man in pay grades E-2 through E-8 for his personal record and guidance.

The importance of NavTra 1414/1 cannot be overemphasized. It serves as a record to indicate to the petty officers and officers supervising your work that you have demonstrated proficiency in the performance of the indicated practical factors and is part of the criteria utilized by your commanding officer when he considers recommending you for advancement. In addition, the proficient demonstration of the applicable practical factors listed on this form can aid you in preparing for the examination for advancement. Remember that the knowledge aspects of the practical factors are covered in the examinations for advancement. Certain knowledge is required to demonstrate these practical factors and additional knowledge can be acquired during the demonstration. Knowledge factors pertain to that knowledge which is required to perform a certain job. In other words, the knowledge factors required for a certain rating depend upon the jobs (practical factors) that must be performed by personnel of that rating. Therefore, the knowledge required to proficiently demonstrate these practical factors will definitely aid you in preparing for the examination for advancement.

NavTra 10052

Bibliography for Advancement Study, NavTra 10052 (Series), is a very important publication for anyone preparing for advancement. This bibliography lists required and recommended Rate Training Manuals and other reference material to be used by personnel working for advancement. NavTra 10052 is revised and issued once each year by the Chief of Naval Training Support. Each revised edition is identified by a letter following the NavTra number. When using this publication, be sure that you have the most recent edition.

The required and recommended references are listed by rate level in NavTra 10052. If you are working for advancement to third class, study the material that is listed for third class. If you are working for advancement to second class, study the material that is listed for second class. Remember that you are also responsible for the references listed at the third class level.

In using NavTra 10052, you will notice that some Rate Training Manuals are marked with an asterisk (*). Any manual marked in this way is MANDATORY–that is, it must be completed at the indicated rate level before you are eligible to take the Navy-wide examination for advancement. Each mandatory manual may be completed by passing the appropriate nonresident career course that is based on the mandatory training manual; passing locally prepared tests based on the information given in the training manual, or in some cases, successfully completing an appropriate Class A School.

Do not overlook the section of NavTra 10052 which lists the required and recommended references relating to the military standards/requirements for advancement. For example, all personnel must complete the Rate Training Manual, Military Requirements for Petty Officer 3 & 2, NavTra 10056-C, for the appropriate rate level before they can be eligible to advance.

The references in NavTra 10052 which are recommended, but not mandatory, should also be studied carefully. All references listed in NavTra 10052 may be used as source material for the written examinations at the appropriate rate levels.

Rate Training Manuals

There are two general types of Rate Training Manuals. Rating manuals (such as this one) are prepared for most enlisted rates, giving information that is directly related to the professional qualifications. Basic manuals give information that applies to more than one rate and rating. Basic Electricity, NavPers 10086-B, is an example of a basic manual, because many ratings use it for reference.

Rate Training Manuals are revised from time to time to keep them up to date technically. The revision of a Rate Training Manual is identified by a letter following the NavTra number. You can tell whether any particular copy of a Rate Training Manual is the latest edition by checking the NavTra number and the letter following this number in the most recent edition of List of Training Manuals and Correspondence Courses, NavTra 10061. (NavTra 10061 is actually a catalog that lists current training manuals and correspondence courses; you will find this catalog useful in planning your study program.)

Rate Training Manuals are designed to help you prepare for advancement. The following suggestions may help you to make the best use of this manual and other Navy training publications when you are preparing for advancement.

1. Study the military requirements and the professional qualifications for your rate before you study the training manual, and refer to the "quals" frequently as you study. Remember, you are studying the training manual in order to meet these "quals."

2. Set up a regular study plan. If possible, schedule your studying for a time of day when you will not have too many interruptions or distractions.

3. Before you begin to study any part of the training manual intensively, become familiar with the entire manual. Read the preface and the table of contents. Check through the index. Look at the appendixes. Thumb through the manual without any particular plan, looking at the illustrations and reading bits here and there as you see things that interest you.

4. Look at the training manual in more detail to see how it is organized. Look at the table of contents again. Then, chapter by chapter, read the introduction, the headings, and the subheadings. This will give you a clear picture of the scope and content of the manual. As you look through the manual in this way, ask yourself some questions: What do I need to learn about this? What do I already know about this? How is this information related to information given in other chapters? How is this information related to the qualifications for advancement?

5. When you have a general idea of what is in the training manual and how it is organized, fill in the details by intensive study. In each study period, try to cover a complete unit—it may be a chapter, a section of a chapter, or a subsection. If you know the subject well, or if the material is easy, you can cover quite a lot at one time. Difficult or unfamiliar material will require more study time.

6. In studying any one unit—chapter, section, or subsection—write down the questions that occur to you. Many people find it helpful to make a written outline of the unit as they study, or at least to write down the most important ideas.

7. As you study, relate the information in the training manual to the knowledge you already have. When you read about a process, a skill, or a situation, try to see how this information ties in with your own past experience.

8. When you have finished studying a unit, take time out to see what you have learned. Look back over your notes and questions. Maybe some of your questions have been answered, but perhaps you still have some that are not answered. Without referring to the training manual, write down the main ideas that you have learned from studying this unit. Do not quote the manual. If you cannot give these ideas in your own words, the chances are that you have not really mastered the information.

9. Use Nonresident Career Courses whenever you can. The nonresident career courses are based on Rate Training Manuals or on other appropriate texts. As mentioned before, completion of a mandatory Rate Training Manual can be accomplished by passing an Nonresident Career Course based on the Rate Training Manual. You will probably find it helpful to take nonresident career courses, as well as those based on mandatory training manuals. Taking a nonresident career course helps you to master the information given in the training manual, and also helps you see how much you have learned.

10. Think of your future as you study Rate Training Manuals. You are working for advancement to third class or second class right now, but some day you will be working toward higher rates. Anything extra that you can learn now will help you.

SOURCE OF INFORMATION

One of the most useful things you can learn about a subject is how to find out more about it. No single publication can give you all the information you need to perform the duties of your rating. You should learn where to look for accurate, authoritative, up-to-date information on all subjects related to the military requirements for advancement and the professional qualifications of your rating.

Some of the publications described in this manual are subject to change or revision from time to time—some at regular intervals, others as the need arises. When using any publication that is subject to change or revision, be sure you have a copy in which all official changes have been made. Studying canceled or obsolete information will not help you perform efficiently or to advance; it is likely to be a waste of time, and may even be seriously misleading.

NOTE: Due to training consolidation, "NavPers" training publications promulgated by the Naval Training Command are re-designated as "NavTra." NavTra publications and stock numbers are listed in Section XIV of NAVSUP 2002, while the NavPers (Bureau of Naval Personnel) publications are listed in Section III.

As you progress through the Petty Officer ranks, your duties and responsibilities become more and more those of the supervisor and instructor. In order to render the proper type of supervision and instruction you must study everything you can relative to supervision and instruction. Some publications that can aid toward becoming an efficient supervisor and instructor are as follows:

1. Instructor Training, NavTra 92050 (Series).
2. Education and Training, NavTra 10827 (Series).
3. Manual for Navy Instructors, NavTra 16103 (Series).
4. Basic Military Requirements, NavTra 10054 (Series).
5. Military Requirements for Petty Officers 3 & 2, NavTra 10056 (Series).

In addition to the above publications you should become familiar with all of the publications dealing with the technical aspects of your rating in order to acquire the technical knowledge to better perform your duties as a PR.

Some references are cited at appropriate places throughout this training manual and should be studied for background information and a better understanding of the subject matter presented.

There are also Naval Air Systems Command technical publications covering each piece of equipment you will be required to maintain. You should always refer to the appropriate publication when working on survival equipment. While you do not need to know everything that is contained in these publications, you should know how to find the necessary information in them.

The NavAir 13-1-6 (Series) manual, prepared by Naval Air Systems Command, provides detailed inspection and maintenance instructions. The manual consists of seven separately bound volumes as listed below:

1. Inflatable Survival Equipment, NavAir 13-1-6.1.
2. Parachutes, NavAir 13-1-6.2.
3. Survival Kits and Items, NavAir 13-1-6.3.
4. Oxygen Equipment, NavAir 13-1-6.4, (In Preparation).
5. Helicopter Rescue Equipment, NavAir 13-1-6.5, (In Preparation).
6. Ejection Seats, NavAir 13-1-6.6, (In Preparation).
7. Aircrew Personal Protective Equipment, NavAir 13-1-6.7.

The purpose of each volume is to provide technical information related to the inspection and maintenance of a category of aircrew safety and survival equipment. The information contained in each volume is intended for organizational, intermediate, or depot levels of maintenance as established within the Naval Aviation Maintenance Program.

CHAPTER 2

PERSONNEL PARACHUTE INSPECTION

PR RESPONSIBILITIES

Parachutes are primarily designed to provide an avenue of escape for pilots and aircrewmen from disabled aircraft. The nature of this lifesaving system leaves no margin for error in the work of the PR.

Parachute inspections must be carefully conducted, insuring comfort, security, rapid positive functioning, and airworthiness of the entire assembly.

FACTORS AFFECTING MALFUNCTIONS

Before inspecting a parachute, the PR must know what to look for. Some of the factors which may cause a malfunction are discussed in the following paragraphs.

Wear

Wear in a parachute is not difficult to detect. It is indicated by chafing at corners or on the outside surfaces where the most frequent contact with moving objects is encountered.

Parts of parachutes and related equipment showing excessive wear should be replaced or repaired, the work to be accomplished at the lowest maintenance level capable of performing the task.

Stains

Stains appear as a discoloration or blemish in the material. Although not all stains are harmful to nylon, they should be considered as harmful agents until identified and proven harmless.

Those stains caused by contact with acid, oil, and salt water are the most harmful to nylon and should be removed as quickly as possible to prevent further deterioration of the material.

PR's must learn to recognize these stains quickly and know the best method of remedying each.

Suspension Lines Out of Position

Be sure that each of the suspension lines is in proper rotation at the connector links and through the canopy.

Compliance With Current Directives

On parachute repack cycles or when otherwise directed, inspect the parachute assembly and components, for updating and compliance with the latest modifications. For each type of parachute, refer to the Aviation-Crew Systems Personnel Parachute Manual, NavAir 13-1-6.2, and recent Aircrew System Bulletins and changes for all current parachute configurations. Do not permit any local modifications without prior approval of proper authority.

Manufacturer's Errors

When inspecting a new parachute, be especially watchful for errors in the material and workmanship. It is easy for a mistake to get by in a large plant where many persons are involved in manufacturing a single product. Newness is not necessarily an indication that an object is perfect or even in the latest configuration. Always make a thorough inspection of every part of a new parachute assembly before it is rigged and packed for service use.

INSPECTION INTERVALS

All parachutes are subjected to periodic inspection and maintenance under the direction and control of the Maintenance Officer to whom the parachute assembly is assigned. Inspection and maintenance procedures must be thorough at all times. No instance of careless treatment or willful neglect of parachute equipment may be allowed to pass unnoticed. The hostile environment and conditions under which this equipment must function should be uppermost in the minds of all personnel concerned. The periodic inspection cycles normally coincide with the applicable aircraft inspection cycles specified in OpNav Inst. 4790.2 (Series). When a parachute assembly must be inspected at a time other than the aircraft calendar interval, a special inspection must then be performed.

The different types of periodic inspections are as follows: daily, 7/14 day, original issue, calendar, special, postcombat, and aircraft accident inspections.

Any parachute assembly which requires inspection, repacking, maintenance, modification, or repair must be handled at the lowest level of maintenance equipped to satisfactorily perform the work. Mission, time, equipment, trained personnel, and operational needs are the basic considerations involved in determining which level is to be used.

TYPES OF INSPECTIONS

Inspections include, but are not limited to, emergency aircraft escape assemblies and/or systems, as well as assemblies used for premeditated free-fall or static line parachute descents. The reserve (emergency) parachute which may form a part of a training type, troop type or test assembly must also be included in the inspections.

Any reserve parachute assembly which has been worn for a jump and not opened shall not be used until an inspection similar to the 7/14 day inspection has been performed. The following information must be recorded on the Parachute History Card: Visual inspection conducted (date) at (activity) by (name) and found suitable for service.

If a discrepancy is found, the parachute must receive a special inspection in accordance with procedures described later in this chapter.

The following criteria must be used to determine the nature of a parachute inspection.

DAILY

The daily inspection is performed on all in-service parachute assemblies either installed in aircraft or stowed in the ready issue rooms. This inspection must be accomplished by line personnel (plane captain or delegated aircrewman) or an issue room custodian who has been checked out by both the AME and PR work centers and found qualified.

The inspection is performed in accordance with local maintenance requirement cards (MRC) by the organizational level maintenance activity personnel, or the issue room custodian. It must be performed prior to daily flight operations and/or following ground transportation of the parachute assembly. This inspection is a visual in-place inspection with minimum requirements as detailed in NavAir 13-1-6.2 for each aircraft. The daily inspection is also included with the 7/14 day inspection when conducted. This inspection, for example, involves checking for external damage and security of tackings or broken strands in tackings. Insure that the ripcord pins are centered in the locking cones.

If any damage or discrepancy is found or suspected, maintenance control must be notified.

SEVEN/FOURTEEN DAY

The 7/14 day inspection (10 day inspection for the A-7 type aircraft) must be performed on all in-service parachute assemblies installed in aircraft and in ready issue rooms. This inspection includes the integrated torso and the quick attachable harnesses. The daily inspection must be included when performing the 7/14 day, (10 day for the A-7) inspection.

This inspection is performed by organizational level maintenance PR personnel or by aircrew/line personnel who have been found qualified by a PR work center supervisor.

Parachute assemblies assigned to OV, VA, VF, and VT type aircraft must be inspected every 7 days. Parachute assemblies assigned to A-7 aircraft will be inspected every 10 days. Parachute assemblies assigned to VP, VR, VS, VH, VW, and VC type aircraft must be inspected every 14 days. Parachute assemblies used for training, para-rescue, pathfinding, and reconnaissance teams and those parachute assemblies not assigned to a specific type of aircraft must be inspected every 14 days.

These inspections include, but are not limited to, emergency aircraft escape assemblies and/or systems, as well as assemblies used for premeditated free-fall or static line parachute descents. The reserve (emergency) parachute which may form a part of a training type, troop type, or a test assembly must also be included in the inspection. If any damage or contamination is found or suspected, notify maintenance control. Upon completion of the inspection, the inspector's full name, rate, and current date must be recorded on the Preflight/Daily/In-Flight/Postflight/Maintenance Record card, using pen and ink only.

NOTE: Do not open the parachute assembly when performing the 7/14 day inspection.

On parachute assemblies that employ a metal ripcord handle clip, the ease of removal of the ripcord handle from the metal clip must be checked on each 7/14 day inspection. To perform this examination, carefully remove the ripcord handle from the clip. The ripcord handle should be retained by the clip but removed easily when pulled. The thumb may be used to check the travel of the handle.

ORIGINAL ISSUE

The original issue inspection is performed at the time a parachute assembly is placed into service. When a parachute assembly is an aircraft inventory item, the acceptance inventory inspection and packing may serve as the original issue inspection. In this case the records and documents concerning the parachute must be examined. If any discrepancy is found, a special inspection, as discussed later in this chapter, must be performed.

SPECIAL

When a parachute assembly must be inspected at a time other than the aircraft calendar inspection interval, a special inspection must be performed on the parachute.

CALENDAR

The calendar inspection of a parachute assembly must correspond with the aircraft calendar inspection but must not exceed 217 days. To meet unusual situations and facilitate workload scheduling, a plus or minus 1 week or portion thereof may be applied to the authorized calendar inspection interval.

Occasionally, an aircraft will sustain a grounding discrepancy, away from home station, the duration of which allows the calendar interval to expire. In order to enable a ferry flight to return the aircraft to home station for calendar inspection, after the grounding discrepancy has been corrected, the necessary additional days may be added to the calendar inspection interval.

In each instance, deviations must apply only to the immediate inspection due. If unusual circumstances dictate deviations of succeeding calendar inspections, each inspection must be computed from the date on which the inspection would have been due if the preceding deviation had not been granted.

When performing the calendar inspection, the procedure described in the following paragraphs should be followed. If doubt exists as to the serviceability of a parachute assembly, it should be forwarded to the next higher level of maintenance.

Preparation

Open the parachute by pulling the ripcord handle with a suitable scale attached. The maximum pull force is 27 pounds (60 pounds for LW-3B). If the maximum pull force is exceeded, the ripcord pins, cones, and grommets must be inspected for bends, dents, and roughness. Insure that the ripcord cable moves freely in its housing. Inspect the housing for sharp bends or dents, and replace damaged parts as necessary. Silicone spray may be sparingly applied to ripcord parts. On all assemblies with metal ripcord handle clip, reinsert the handle into the clip and seat the handle fully. Reset the scale to read 0. Using a straight, steady pull, remove the handle from the clip. The force required to remove the handle from the clip must be 10 to 20 pounds.

If not within limits, examine the clip for corrosion, sharp edges, bends, twists, and dents. The clip may be adjusted by using pliers, taking care not to mar the clip. If any maintenance was performed on the clip, repeat the test.

Examine the webbing for contamination, fraying, loose or broken stitches, cuts, and burns. Replace any damaged stitching; if other damage exists, replace webbing and/or clip.

CAUTION: On all assemblies having an automatic actuator installed, insure that the arming cable is not pulled while the actuator is armed.

Canopy

Layout of the canopy and suspension lines must not be undertaken before safety pins are inserted into the fail-safe ballistic spreading gun and the static line cutter as installed in applicable parachute assemblies.

Lay out the canopy on a clean packing table so that the nameplate gore is facing up. Position the connector links on the tensioning device and engage the hook at the opposite end of the packing table into the loop of the pilot chute connector strap.

The helper raises suspension line number 1 so that gore number 1 is stretched taut from the skirt hem to the peak. The packer starts at the skirt hem and inspects the upper radial seam from the skirt hem to the peak. He inspects the vent hem, collar and ring, lower radial seam, fabric surface, diagonal seams or tapes, and the skirt hem.

Minor defects which will not degrade structural integrity of the parachute assembly need not be reported on a canopy damage chart. If necessary, minor defects may be corrected by light brushing or trimming. Major defects which will degrade structural integrity of the assembly are reported on the applicable canopy damage chart.

Major defects are treated as holes, rips, or tears when repaired. For more detailed classification of manufacturing defects refer to the Personnel Parachute Manual, NavAir 13-1-6.2.

The helper records the damage found by the packer on to the canopy damage chart and the same procedure is used to inspect all of the canopy gores.

For the determination of repairability, a canopy is considered beyond repair for any of the following reasons: one or more complete gores are torn or there are holes larger than 8 inches long in four or more sections. If damaged beyond repair, the canopy must be forwarded to Supply for screening. Any section with holes, tears, or cuts larger than 8 inches must be replaced in accordance with applicable drawings and specifications. Only two single patches or one double patch may be installed on a single section. If additional patches are required, replace the section. Any hole, cut, or tear 1 inch square or less may be patched with a single patch.

A severe separation or a separation with broken threads is patched using a single reinforcement patch.

Holes, tears, and cuts larger than 1 inch square must be repaired using a double patch, one on the inside and one on the outside of the gore section. The inside patch must be applied first.

If a thread separation is not severe and no threads are broken, the threads can be pressed into place by using a soft brush or a pencil eraser. If the damaged area is brushed in the wrong direction, the separation will increase.

Suspension Lines

To inspect suspension lines, the packer and helper grasp one group of suspension lines at the connector links and walk toward the canopy skirt hem, allowing the lines to run freely over the palm of the hand. Visually examine the lines for damage and defects. Upon reaching the skirt hem, the remaining groups of lines are grasped and inspected in like manner, walking toward the connector links. The lines at the canopy vent are also visually examined. The inspection must include, but is not limited to the following:

1. Inspect the connector link tie for fraying of the free end in excess of 1/2 inch. The frayed free end may be trimmed to 1/4 inch from the zig-zag stitching.

2. Check general conditions of the suspension lines, including: frayed, ruptured, dirty, lumpy, hard or thin spots; friction burns; improper overlap length; protruding inner core lines; presence of twists in the individual lines; improper sequence of lines on the connector links; and proper length of the suspension lines (plus or minus 2 percent). If core lines protrude, and are between 5 and 10 inches apart, they may be carefully trimmed next tc the casing.

3. Inspect the V-tabs at the skirt hem for condition and proper attachment.

4. Replace suspension lines in accordance with applicable drawings and specifications if any of the following conditions exist: knotted or spliced line, frayed spot, ruptured outer casing, and thin spots. Replacement is also necessary if two core yarns are protruding through the casing less than 5 inches apart, or a single core line protrudes at a thin spot at the V-tab where the diameter of the line is reduced to less than 2/3 of full size (visually determined), or any line not manufactured in accordance with applicable drawings.

5. For emergency escape parachutes, the suspension line must be replaced if any burned or hard spots are detected.

For training and premeditated use, one burn or hard spot per suspension line is acceptable, provided the length is less than 1 inch and the line remains flexible at that point. Defects should be noted on the Parachute History Card. If the defects are severe enough to affect the safe operation of the parachute assembly, the suspension line must be replaced.

Fail Safe Ballistic Spreading Gun

To inspect the fail safe ballistic spreading gun, examine the following:

WARNING: During the time that the safety pin is removed for inspection, the spreading gun is armed. Do not attempt any inspection or work on the gun, assembly or lanyard while the safety pin is removed.

1. Inspect for ease of operation of the safety pin, presence of the two locking balls, condition of the pendant and pendant stowage strap. Insert the safety pin.

2. Inspect the extractor sleeve for contamination, fraying, loose or broken stitching, security and condition of the fasteners, and security of attachment to the spreading gun.

3. Inspect the lower firing lanyard for contamination, twists, cuts, burns, fraying and security of attachment to the spreading gun. Remove any twists as necessary.

4. Inspect the stowage sleeve for contamination, fraying, burns, cuts, and condition of the hardware.

5. Inspect the spreading gun for corrosion, security of the slugs and plates, and condition of the plastic lock seal. Insure that the lock seal is not broken.

6. Inspect the plate screws for the presence of tamper dots. If the tamper dots are broken, torque the plate screws to 6 ± 1/2 inch-pounds and apply the tamper dots.

7. Inspect the upper firing lanyard for proper attachment at the vent, security of attachment to the spreading gun, cuts, burns, fraying, and contamination.

8. Inspect the slug loops on the canopy skirt for contamination, cuts, burns, fraying, and security of the stitching.

NOTE: The spreading gun cartridge has a service life of 5 years from the date of manufacture, or 30 months after removal from the hermetic sealed container, whichever occurs first.

Record the cartridge service life expiration date on the Parachute History Card.

9. If the service life of the cartridge will expire before the next scheduled repack, replace the cartridge.

NOTE: The cartridge must be removed from the spreading gun prior to shipment.

10. If any damage to the spreading gun exists, remove the assembly. Forward the cartridge and damaged gun to Supply under its component stock number for screening.

Ballistic Spreading Gun Cartridge Replacement And Pull-Force Check

To replace the cartridge and measure the firing pin pull-force, proceed as follows:

WARNING: The spreading gun employs an explosive cartridge. Failure to observe the procedures in this section could result in death or serious injury. The safety pin must be installed.

1. Clamp the spreading gun test fixture to the packing table.

2. Remove the cartridge extractor wrench from the swivel bolt attached to the spreading gun clamp assembly.

3. Place the cartridge end of the spreading gun into the spreading gun clamp assembly. Insure that the lip on the clamp assembly circles the spreading gun housing. Route the upper firing lanyard through the vertical slot in the center of the clamp and spread the suspension lines to prevent entrapment between the gun and the clamp. Position the swivel bolt in the horizontal slot in the clamp and tighten the nut to 7 ± 1/2 foot-pounds.

CAUTION: Insure that the spanner wrench surface mates with the cartridge. Resurface the spanner wrench if required.

4. Place the pins of the cartridge extractor wrench into the holes in the cartridge. Remove the cartridge using palm pressure against a 3/4 inch-socket. Remove the cartridge from the upper firing lanyard by removing the pin. Retain the pin for reinstallation if required. Dispose of the cartridge in accordance with current directives.

5. Remove the spreading gun from the clamp assembly and reposition the cartridge extractor wrench on the swivel bolt.

6. Remove the safety pin from the spreading gun.

7. Spread the canopy skirt hem and suspension lines aside to expose the cartridge chamber. Slide the spreading gun onto the test fixture shaft so that the shaft butts against the bottom of the cartridge chamber.

8. Open the four snap fasteners on the spreading gun extractor sleeve to expose the firing pin housing. Slide the block assembly at the center of the test fixture under the firing pin housing until the block assembly pin slides into the base plate hole. Aline the firing pin so that the hole in the firing pin is horizontal and the lower firing lanyard is located on the top.

9. Attach the hook assembly to the firing pin hole and slide the hook assembly block over the nut attached to the pull gage.

10. Move the switch on the pull gage to the center position. Zero the meter needle by rotating the bezel. Move the switch to the full down position, away from the meter, for recording the pull force.

NOTE: Do not pull the firing pin further than necessary for release. Do not remove the pin. Permanent damage to the gun may result.

11. Pull the test fixture lever until the firing pin releases. The pull force must register between 25 and 38 pounds. If a gun has failed the first test, it must be tested twice more. The gun must pass both retests. When a gun fails, it must be removed and returned to Supply. Record the pull force required to operate the gun.

12. After the pull force measurement has been obtained and recorded, remove the hook assembly from the firing pin.

13. Push the firing pin back into the housing. Push the control disk firmly inward, forcing the firing pin out of the housing. Apply inward hand pressure to the firing pin as it moves out. Continue to move the control disk inward, applying hand pressure to the firing pin, until the firing pin clicks into place. When the click is heard, the gun is cocked. Gently release the control disk while exerting pressure on the pin.

14. Tug gently on the firing pin until the effect of spring loading is felt. If the pin moves without spring tension, the gun is not cocked, and step 13 must be repeated.

15. Release the block assembly by pulling the pin out of the hole in the base plate and sliding the assembly away from the spreading gun. Remove the gun from the shaft. Do not remove the gun by pulling on the lower firing lanyard.

16. Install the safety pin.

17. Clean the cartridge chamber and threads with a small amount of denatured alcohol. Insure that any remaining old sealing compound and foreign matter is removed. The gun can be tilted to allow alcohol to drain out of the gun.

NOTE: Do not allow alcohol to flow inside the gun as this could damage O-rings and lubrication.

18. Replace the spreading gun in the clamp assembly in accordance with the procedures listed in step 3.

19. Feel the inside of the cartridge chamber to insure that the slug pistons do not protrude. The bottom of the chamber should be smooth metal.

20. Apply sealing compound, Type I or II to the first two threads of the cartridge.

21. Record the cartridge load date, load lot number, and the service life expiration date on the Parachute History Card.

22. Attach a new cartridge to the upper firing lanyard by passing the pin through the screw base of the cartridge and loop in the end of the lanyard.

23. Insert, and thread the cartridge into the chamber and torque to a value of 20 ± 2 foot-pounds, using the cartridge extractor wrench.

24. Remove the spreading gun from the clamp assembly, but do not remove the safety pin.

25. Check the stowage of the lower firing lanyard and close the extractor sleeve.

Harness/Riser Assembly Inspection

When checking the harness and riser assemblies, examine the hardware for corrosion, rust, cracks, breaks, bends, or other damage, and for ease of operation. Inspect the webbing for signs of contamination, cuts, twists, fraying, burns, and loose or broken stitching (in excess of three stitches). If less than three stitches are loose or broken, the harness or riser assembly can be repaired. Inspect the riser to container connecting strap for security of attachment. Repair loose or broken stitches.

Inspect the strap assembly snap fastener sockets for proper configurations, mating to the container, ease of release if pulled from the connector link end of the riser, and for security of attachment.

Pilot Chute

Examine the pilot chute for stains, broken or loosened stitching in the seams, and holes or tears in the canopy. Check closely the coiled springs for breaks, bends, and proper spring tension. Check the connector cord for length of cord and loops and for damage and security of the connecting knots.

Ripcords and Housings

The ripcord housing should be checked for security of the end ferrules to the coil housing, for breaks, crushing, or other deformation of the housing. Check for the proper location and security of attachment.

The ripcord is checked for proper length, bent, broken, or rough locking pins, the swaged joints for attachment, and the cable for frayed strands and rust or corrosion.

Seat Cushions And Pads

Look closely at the cushions and pads for overall condition. See that all keepers are secure and that all snaps are in good working order and fastened properly.

A defective or missing snap fastener should be repaired or replaced, and damage to the cover or weakened stitching should be repaired.

Contamination Inspection

All parachute assemblies must be carefully inspected for evidence of contamination. When a discoloration appears on the parachute container, canopy, or related equipment, the stain should be identified and remedied as soon as possible. The identification of these discolorations or stains may be accomplished by several methods, the best of which is to identify by sight the more common stains as follows:

1. Acid stains appear as a gray putty-colored stain or a powdery ash, depending upon the strength of the acid solution which made the stain. To determine whether the contamination is of acid or alkaline origin, the stain must be tested with pH test paper.

2. Salt water stains are generally characterized by the appearance of a white crystalline substance on the surface of the material with a slight discoloration in the area.

3. Oil and grease stains have a greenish color and produce an oily or greasy feeling when touched or rubbed between the fingers.

Parachutes and components stained by any of these or other injurious substances must be cleaned as described in chapter 10 of this manual. If the contamination cannot be removed, the parachute assembly should be forwarded to a depot level maintenance activity for additional cleaning. Attach a report of the nature and location of all stains.

Service Life Check

The service life of all emergency use parachute assemblies and their components (i.e., main personnel parachute canopies, pilot parachutes, external pilot parachutes, static lines, riser subassemblies, harnesses, torso harness, containers, cross connector straps, pilot parachute connector straps, anti-squid lines, and spreading gun lanyards) is 7 years from the date placed in service (opening of the manufacturer's package), or 10 years from the date of manufacture, whichever occurs first.

The service life of all drogue parachute canopies, and drogue connecting lines, is 7 years from the date they were placed in service (opening of the manufacturer's package), or 10 years, whichever occurs first, unless otherwise stated in the applicable chapter of a specific system or subsystem.

The service life for all premeditated use (troop and training) parachute assemblies and their components (i.e., main and reserve parachute canopies, pilot parachutes, deployment sleeves and bags, static lines, riser subassemblies, harnesses, main and reserve containers, cross connector straps, pilot parachute connector straps, and control lines) is 10 years of service (opening of the manufacturer's package), or 13 years from the date of manufacture, whichever occurs first.

NOTE: Under no circumstances may canopies, harnesses, or riser subassemblies be subjected to more than 100 deployments.

When a parachute assembly or subassembly reaches the service age/life limit, return it to Supply for appropriate disposition in accordance with current Supply instructions.

When a parachute is placed in service from stores, the month/year of opening the manufacturer's individual shipping container must be stenciled on the parachute's nameplate gore. Letters must be 1/2 inch high and made with blue parachute marking fluid (MIL-I-6903). The term "date placed in service" followed by month/year notation must be placed directly below the nameplate.

When an in-service parachute lacks a start of service date, the service life will expire 7 years from the date of manufacture.

NOTE: On MBEU assemblies if determination of age of a canopy is unclear, as reasonable an estimate as possible must be made from information on the Parachute History Card and other available parachute records. All MBEU canopies manufactured after June 1967 have a date of manufacture located on gore number 1 near the skirt hem.

If no date of manufacture is available on a subassembly, the date marked on the parachute canopy will apply to the subassembly.

If the parachute assembly is not to be repacked immediately after conducting the inspection, chain the suspension lines and place the assembly loosely in a stowage bag, storage bin, or a designated storage area.

NOTE: Airing of parachutes is no longer required. If an assembly is damp, however, hang it from the vent lines in a wet locker until the assembly looks and feels dry.

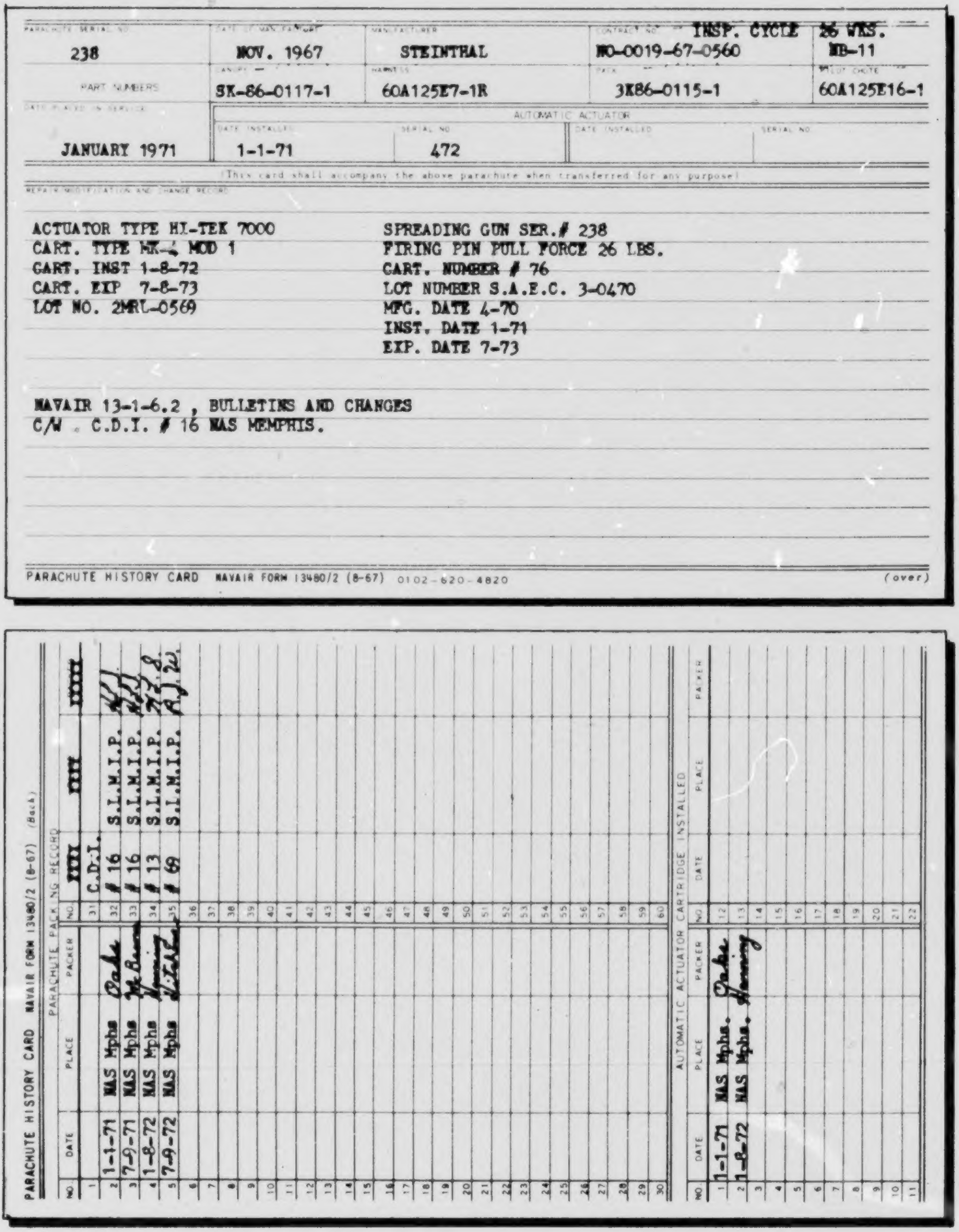
POST COMBAT

Organizational level maintenance must inspect parachute assemblies for external damage or abnormal condition after each combat mission. When an aircraft has been subjected to gunfire, all onboard parachutes must be examined for damage prior to the next flight. If it is found that bullets or fragments have entered the parachute assembly, remove it from service and perform a special inspection.

AIRCRAFT ACCIDENT REPORT

Any personnel parachute along with its related subassemblies or equipment (that is, pilot parachutes, stabilization parachutes, containers, harness, cushions, automatic actuator, ballistic spreading gun) which have been recovered following use in an emergency bailout or ejection should be returned to Supply.

The Supply activity receiving the used parachute assembly will forward the parachute to the Naval Aerospace Recovery Facility, El Centro, California. Every attempt should be made to leave the parachute assembly in the condition which generated the need for an engineering evaluation.



PARACHUTE SERIAL NO. 238	DATE OF MANUFACTURE NOV. 1967	MANUFACTURER STEINTHAL	CONTRACT NO. INSP. CYCLE NO-0019-67-0560	26 WKS. NB-11
PART NUMBERS	CANOPY SK-86-0117-1	HARNESS 60A125E7-1R	PACK 3K86-0115-1	PILOT CHUTE 60A125E16-1

DATE PLACED IN SERVICE: JANUARY 1971

AUTOMATIC ACTUATOR

DATE INSTALLED	SERIAL NO.	DATE INSTALLED	SERIAL NO.
1-1-71	472		

(This card shall accompany the above parachute when transferred for any purpose)

REPAIR/MODIFICATION AND CHANGE RECORD

ACTUATOR TYPE HI-TEK 7000	SPREADING GUN SER.# 238
CART. TYPE MK-4 MOD 1	FIRING PIN PULL FORCE 26 LBS.
CART. INST 1-8-72	CART. NUMBER # 76
CART. EXP 7-8-73	LOT NUMBER S.A.E.C. 3-0470
LOT NO. 2MRL-0569	MFG. DATE 4-70
	INST. DATE 1-71
	EXP. DATE 7-73

NAVAIR 13-1-6.2 , BULLETINS AND CHANGES
C/W . C.D.I. # 16 NAS MEMPHIS.

PARACHUTE HISTORY CARD NAVAIR FORM 13480/2 (8-67) 0102-620-4820 (over)

PARACHUTE HISTORY CARD NAVAIR FORM 13480/2 (8-67) (Back)

PARACHUTE PACKING RECORD

NO.	DATE	PLACE	PACKER	NO.	XXXX	XXXX	XXXXX
1				31	C.D.I.		
2	1-1-71	NAS Mphs	Oaks	32	# 16	S.I.M.I.P.	[illegible]
3	7-9-71	NAS Mphs	McBrown	33	# 16	S.I.M.I.P.	[illegible]
4	1-8-72	NAS Mphs	Henning	34	# 13	S.I.M.I.P.	[illegible]
5	7-9-72	NAS Mphs	[illegible]	35	# 69	S.I.M.I.P.	R.J.W.
6				36			
7				37			
8				38			
9				39			
10				40			
11				41			
12				42			
13				43			
14				44			
15				45			
16				46			
17				47			
18				48			
19				49			
20				50			
21				51			
22				52			
23				53			
24				54			
25				55			
26				56			
27				57			
28				58			
29				59			
30				60			

AUTOMATIC ACTUATOR CARTRIDGE INSTALLED

NO.	DATE	PLACE	PACKER	NO.	DATE	PLACE	PACKER
1	1-1-71	NAS Mphs.	Oaks	12			
2	1-8-72	NAS Mphs.	Henning	13			
3				14			
4				15			
5				16			
6				17			
7				18			
8				19			
9				20			
10				21			
11				22			

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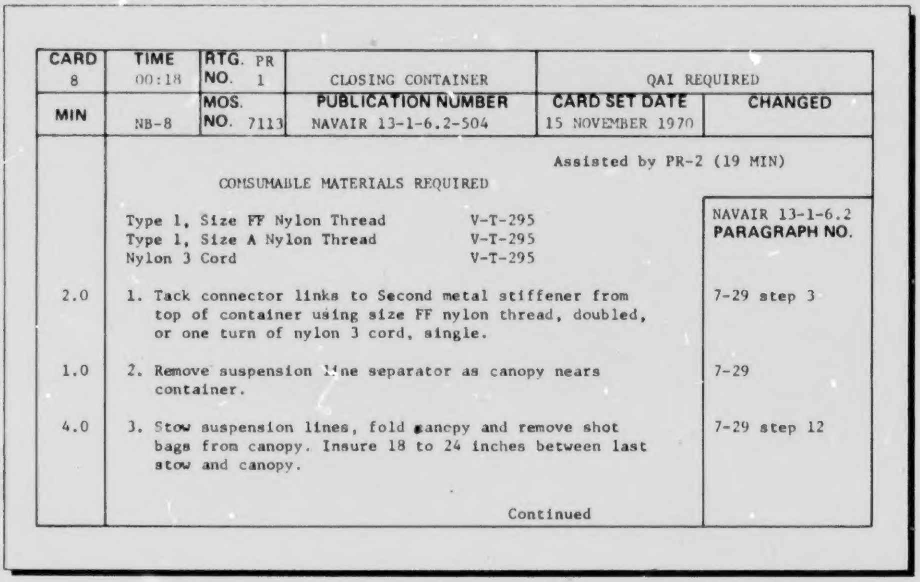
Figure 2-1.—Parachute History Card.



CARD 8	TIME 00:18	RTG. PR NO. 1	CLOSING CONTAINER	QAI REQUIRED	
MIN	NB-8	MOS. NO. 7113	PUBLICATION NUMBER NAVAIR 13-1-6.2-504	CARD SET DATE 15 NOVEMBER 1970	CHANGED

Assisted by PR-2 (19 MIN)

CONSUMABLE MATERIALS REQUIRED

Type 1, Size FF Nylon Thread	V-T-295
Type 1, Size A Nylon Thread	V-T-295
Nylon 3 Cord	V-T-295

		NAVAIR 13-1-6.2 PARAGRAPH NO.
2.0	1. Tack connector links to Second metal stiffener from top of container using size FF nylon thread, doubled, or one turn of nylon 3 cord, single.	7-29 step 3
1.0	2. Remove suspension line separator as canopy nears container.	7-29
4.0	3. Stow suspension lines, fold canopy and remove shot bags from canopy. Insure 18 to 24 inches between last stow and canopy.	7-29 step 12

Continued

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Figure 2-2.–Shop Process Card from the set applicable to the NB-8 parachute assembly.

RECORDS AND DOCUMENTS

The records and documents used by the Aircrew Survival Equipmentman, under the direction of the Maintenance Control Officer, is to provide a systematic means of control. This system also provides a list of historical data elements and a complete documentary function necessary to provide evidence of inspections and maintenance task accomplishments.

PARACHUTE HISTORY CARD

The Parachute History Card contains all normal inspection and repacking data except the daily and 7/14 inspections.

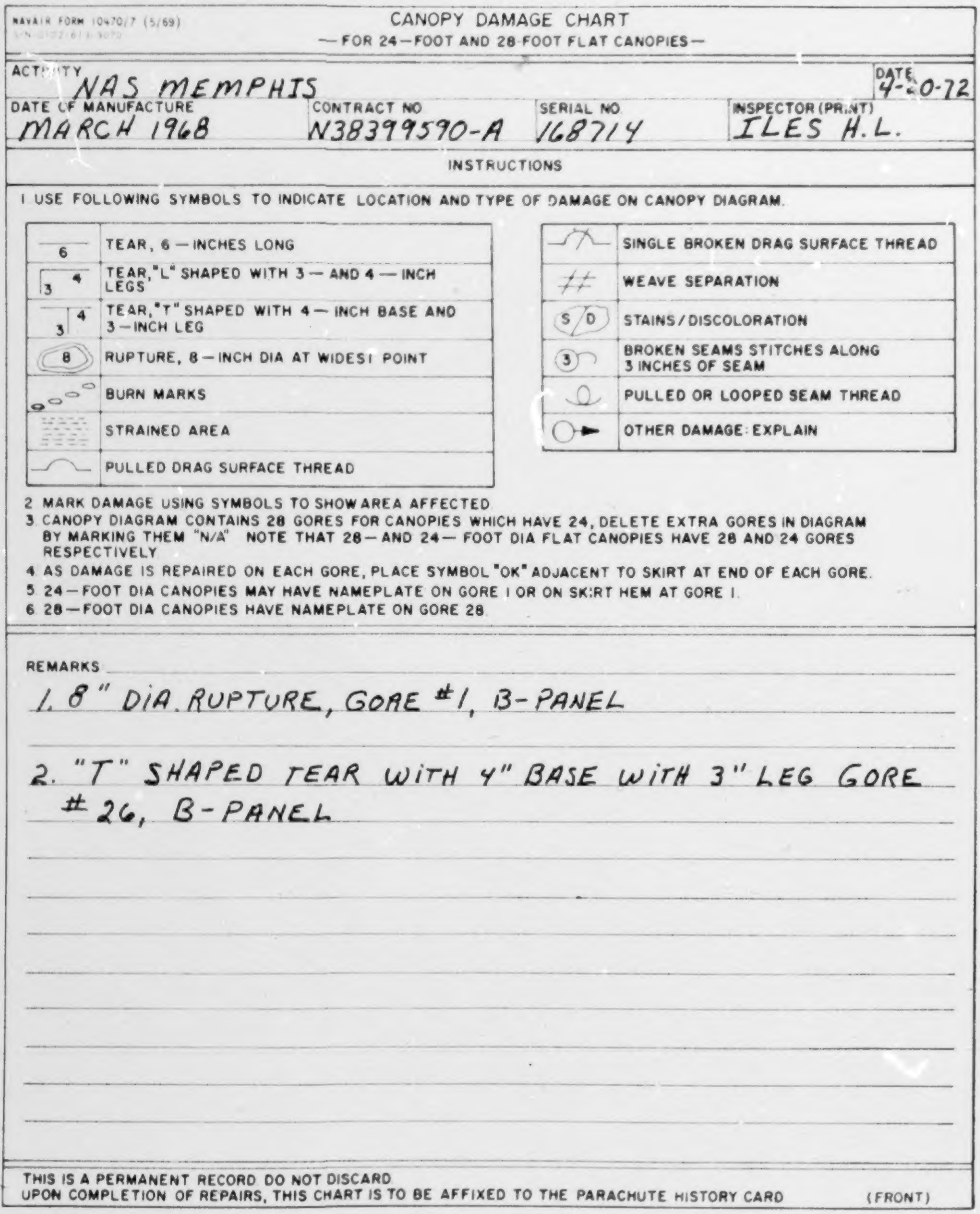
Required entries that must be recorded on the Parachute History Card are as follows:

1. Parachute serial number.
2. Manufacturer.
3. Date of manufacture.
4. Contract number.
5. Type of parachute.
6. Part numbers of the canopy, harness, pack, and pilot chute.
7. Date that the parachute assembly was placed into service.
8. Automatic actuator type and serial number, date of installation, expiration date, time delay, cartridge load lot number, and inspection cycle.

This information, in part, is recorded in the upper right hand corner of the card front. In cases where the aircraft inspection cycle is changed, a notification is added to the card referencing the specific entry in the Aircraft Log Book authorizing the change.

9. Repairs, modifications, and changes. The record must include the date, signature of person accomplishing the modification, (or other significant configuration data), quality assurance inspection and verification, and the geographic location of accomplishment.
10. Date, place, and signature of person packing the parachute.

When for any reason, a new Parachute History Card is initiated, the old card must be retained



NAVAIR FORM 10470/7 (5/69)
S/N-0102-613-3070

CANOPY DAMAGE CHART
—FOR 24—FOOT AND 28-FOOT FLAT CANOPIES—

ACTIVITY NAS MEMPHIS			DATE 4-20-72
DATE OF MANUFACTURE MARCH 1968	CONTRACT NO N38399590-A	SERIAL NO 168714	INSPECTOR (PRINT) ILES H.L.

INSTRUCTIONS

1 USE FOLLOWING SYMBOLS TO INDICATE LOCATION AND TYPE OF DAMAGE ON CANOPY DIAGRAM.

6	TEAR, 6—INCHES LONG		SINGLE BROKEN DRAG SURFACE THREAD
3 4	TEAR, "L" SHAPED WITH 3— AND 4—INCH LEGS	#	WEAVE SEPARATION
3 4	TEAR, "T" SHAPED WITH 4— INCH BASE AND 3—INCH LEG	S/D	STAINS/DISCOLORATION
8	RUPTURE, 8—INCH DIA AT WIDEST POINT	3	BROKEN SEAMS STITCHES ALONG 3 INCHES OF SEAM
	BURN MARKS		PULLED OR LOOPED SEAM THREAD
	STRAINED AREA	○→	OTHER DAMAGE: EXPLAIN
	PULLED DRAG SURFACE THREAD		

2 MARK DAMAGE USING SYMBOLS TO SHOW AREA AFFECTED
3 CANOPY DIAGRAM CONTAINS 28 GORES FOR CANOPIES WHICH HAVE 24, DELETE EXTRA GORES IN DIAGRAM BY MARKING THEM "N/A" NOTE THAT 28— AND 24— FOOT DIA FLAT CANOPIES HAVE 28 AND 24 GORES RESPECTIVELY
4 AS DAMAGE IS REPAIRED ON EACH GORE, PLACE SYMBOL "OK" ADJACENT TO SKIRT AT END OF EACH GORE.
5 24—FOOT DIA CANOPIES MAY HAVE NAMEPLATE ON GORE 1 OR ON SKIRT HEM AT GORE 1.
6 28—FOOT DIA CANOPIES HAVE NAMEPLATE ON GORE 28

REMARKS

1. 8" DIA. RUPTURE, GORE #1, B-PANEL

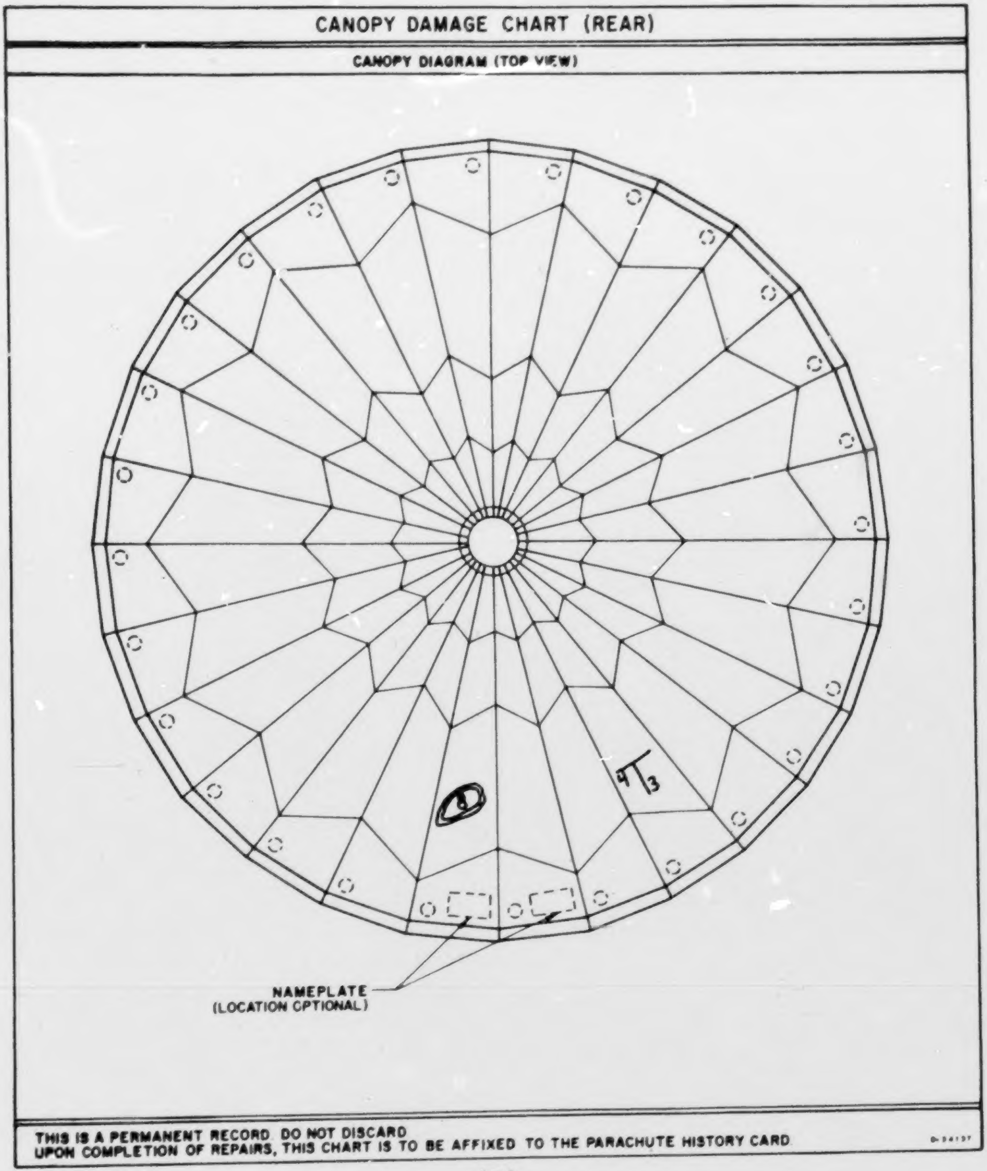
2. "T" SHAPED TEAR WITH 4" BASE WITH 3" LEG GORE #26, B-PANEL

THIS IS A PERMANENT RECORD DO NOT DISCARD
UPON COMPLETION OF REPAIRS, THIS CHART IS TO BE AFFIXED TO THE PARACHUTE HISTORY CARD (FRONT)

(A)

PR.143

Figure 2-3.—(A) Canopy Damage Chart for 24- and 28-foot diameter canopies (front).



CANOPY DAMAGE CHART (REAR)

CANOPY DIAGRAM (TOP VIEW)

9T3
NAMEPLATE
(LOCATION OPTIONAL)

THIS IS A PERMANENT RECORD DO NOT DISCARD
UPON COMPLETION OF REPAIRS, THIS CHART IS TO BE AFFIXED TO THE PARACHUTE HISTORY CARD

(B)

PR.144

Figure 2-3.–(B) Canopy Damage Chart for 24- and 28-foot diameter canopies (rear).

and stapled on the back of the new card. The Parachute History Card will accompany the parachute assembly to the packing loft each time the assembly is inspected, modified, repaired, repacked or otherwise serviced. Whenever a parachute assembly is transferred from one unit to another, an updated Parachute History Card must be forwarded to the receiving unit. The card will be placed in a suitable sized envelope and attached to the assembly. If the parachute is an aircraft inventory item, the Parachute History Card is inserted into the Inventory Log Book and forwarded. If the receiving unit fails to receive the card, a formal request should be sent to the former unit.

Figure 2-1 shows a Parachute History Card.

SHOP PROCESS CARDS

The Shop Process Card set contains the minimum original issue/calendar/special inspection shop requirements. Procedures are given to inspect the parachute assembly for material degradation that may have occurred during the preceding inspection period and to perform essential preventive maintenance.

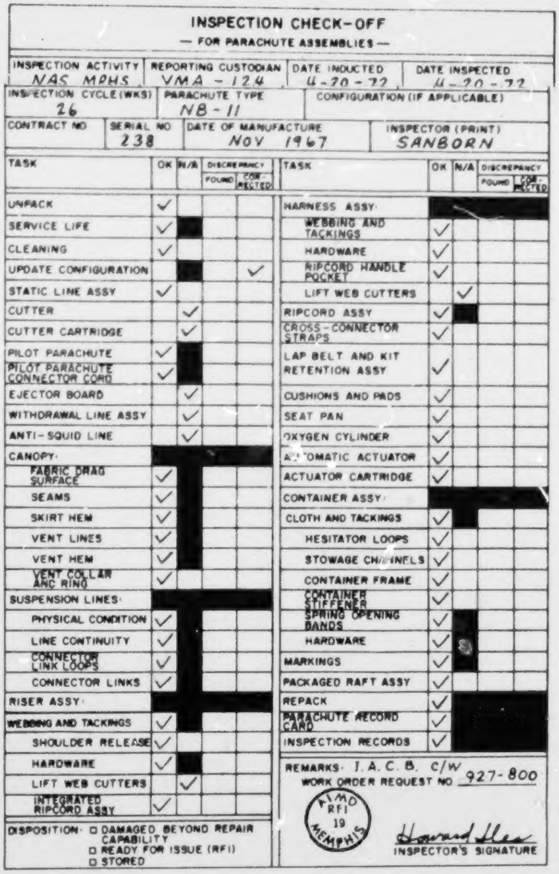
Clearances, tolerances, illustrations, material and equipment required, with a publication reference, are presented where pertinent. The Shop Process Card set is arranged in a logical sequence to aid the Aircrew Survival Equipmentman.

Each step includes a paragraph number that refers to the applicable paragraph in the NavAir 13 series manual concerned. A green card is used to add pen and ink changes when an interim change is received. The completed green card is then inserted into the proper location of the card deck. This card will be replaced at a later date with a change card. A typical Shop Process Card is shown in figure 2-2.

CANOPY DAMAGE CHART

Whenever a parachute canopy is inspected and found to need repairs, the appropriate Canopy Damage Chart must be filled out. A Canopy Damage Chart for 24- and 28-foot diameter canopies is shown in figure 2-3.

If repairs cannot be accomplished locally, the chart must accompany the canopy to the next higher level of maintenance. This form must not be discarded. Upon completion of the repairs, the Canopy Damage Chart is to be affixed to the Parachute History Card.



INSPECTION CHECK-OFF
— FOR PARACHUTE ASSEMBLIES —

INSPECTION ACTIVITY: NAS MPHS
REPORTING CUSTODIAN: VMA - 124
DATE INDUCTED: 4-20-72
DATE INSPECTED: 4-20-72
INSPECTION CYCLE (WKS): 26
PARACHUTE TYPE: NB-11
CONFIGURATION (IF APPLICABLE):
CONTRACT NO:
SERIAL NO: 238
DATE OF MANUFACTURE: NOV 1967
INSPECTOR (PRINT): SANBORN

TASK	OK	N/A	DISCREPANCY	
			FOUND	CORRECTED
UNPACK	✓			
SERVICE LIFE	✓	■		
CLEANING	✓			
UPDATE CONFIGURATION		■		✓
STATIC LINE ASSY	✓			
CUTTER		✓		
CUTTER CARTRIDGE		✓		
PILOT PARACHUTE	✓	■		
PILOT PARACHUTE CONNECTOR CORD	✓	■		
EJECTOR BOARD		✓		
WITHDRAWAL LINE ASSY		✓		
ANTI-SQUID LINE		✓		
CANOPY:	■	■	■	■
FABRIC DRAG SURFACE	✓	■		
SEAMS	✓	■		
SKIRT HEM	✓	■		
VENT LINES	✓	■		
VENT HEM	✓	■		
VENT COLLAR AND RING	✓			
SUSPENSION LINES:	■	■	■	■
PHYSICAL CONDITION	✓	■		
LINE CONTINUITY	✓	■		
CONNECTOR LINK LOOPS	✓	■		
CONNECTOR LINKS	✓	■		
RISER ASSY:	■	■	■	■
WEBBING AND TACKINGS	✓	■		
SHOULDER RELEASE	✓			
HARDWARE	✓	■		
LIFT WEB CUTTERS		✓		
INTEGRATED RIPCORD ASSY	✓			

TASK	OK	N/A	DISCREPANCY	
			FOUND	CORRECTED
HARNESS ASSY:	■	■	■	■
WEBBING AND TACKINGS	✓			
HARDWARE	✓			
RIPCORD HANDLE POCKET	✓			
LIFT WEB CUTTERS		✓		
RIPCORD ASSY	✓	■		
CROSS-CONNECTOR STRAPS	✓			
LAP BELT AND KIT RETENTION ASSY	✓			
CUSHIONS AND PADS	✓			
SEAT PAN	✓			
OXYGEN CYLINDER	✓			
AUTOMATIC ACTUATOR	✓			
ACTUATOR CARTRIDGE	✓			
CONTAINER ASSY:	■	■	■	■
CLOTH AND TACKINGS	✓	■		
HESITATOR LOOPS	✓			
STOWAGE CHANNELS	✓			
CONTAINER FRAME	✓			
CONTAINER STIFFENER	✓			
SPRING OPENING BANDS	✓	■		
HARDWARE	✓	■		
MARKINGS	✓	■		
PACKAGED RAFT ASSY	✓			
REPACK	✓	■	■	■
PARACHUTE RECORD CARD	✓	■	■	■
INSPECTION RECORDS	✓	■	■	■

DISPOSITION:
☐ DAMAGED BEYOND REPAIR CAPABILITY
☐ READY FOR ISSUE (RFI)
☐ STORED

REMARKS: I.A.C.B. C/W
WORK ORDER REQUEST NO 927-800

AIMD RFI 19 MEMPHIS

INSPECTOR'S SIGNATURE

PR.108

Figure 2-4.—Inspection Check-Off form for parachute assemblies.

NOTE: Do not make any marks on the parachute canopy.

INSPECTION CHECK-OFF

The sequence of inspection tasks to be performed is indicated on the Inspection Check-Off form. (See fig. 2-4.)

This form is a recommended aid to be used when Shop Process Cards are not available. The Inspection Check-Off form may be locally reproduced.

As each task is completed the appropriate OK or DISCREPANCY FOUND box is initialed. If a task does not apply to a particular assembly the N/A box is initialed.

QUALITY ASSURANCE

The most critical periods for assuring the performance of a parachute assembly are the original issue, calendar, special inspection, and the repacking of an assembly. Therefore, quality assurance steps are provided for the critical operations in the Shop Process Cards and as underlined in the Personnel Parachute Manual, NavAir 13-1-6.2.

When a step is noted or underlined, the parachute rigger performs the step and then has his performance verified by a collateral duty inspector.

Work Center supervisors are primarily responsible for quality assurance, and they may delegate experienced personnel in the loft to perform the inspections. In no case may a person who performed the work perform his own quality assurance inspection.

CHAPTER 3

PERSONNEL PARACHUTE FAMILIARIZATION

In 1495, shortly after Columbus discovered America, another great Italian, Leonardo da Vinci, designed the first parachute. This was a huge pyramid of cloth, but a functional parachute was not actually made and used until more than a century later. The word "parachute" is derived from the Italian word "parare," meaning to protect or shield from, and from the French word "chute," meaning a fall or quick descent–literally, "to protect from a fall."

Fausto Veranzio, also an Italian, is given credit for the first parachute jump. He made this jump in 1617 from a tower in Venice, using a parachute made of a square wooden frame, covered with canvas. Since man had no use for a lifesaving device of this nature, parachutes were considered novelties or items of amusement, and interest in them gradually dwindled. It was not until the invention of the first aerial balloon that interest in the parachute was renewed.

In 1783, the Montgolfier brothers invented a balloon which would stay aloft. This balloon was kept in the air by burning bundles of straw beneath the bag to furnish the necessary supply of hot air. If the fabric should catch fire, the flight was abruptly ended. This meant that men who went up on such flights had to have a means of escape and descent. This necessity for a lifesaving device removed the parachute from the list of novelties.

In 1808, Andre Kuparento, a Polish balloonist, became the first man to leap to safety from a flaming bag of hot air, using a parachute. The need for a foolproof parachute, however, did not become sufficiently acute to stimulate a great deal of inventive effort until nearly 100 years later.

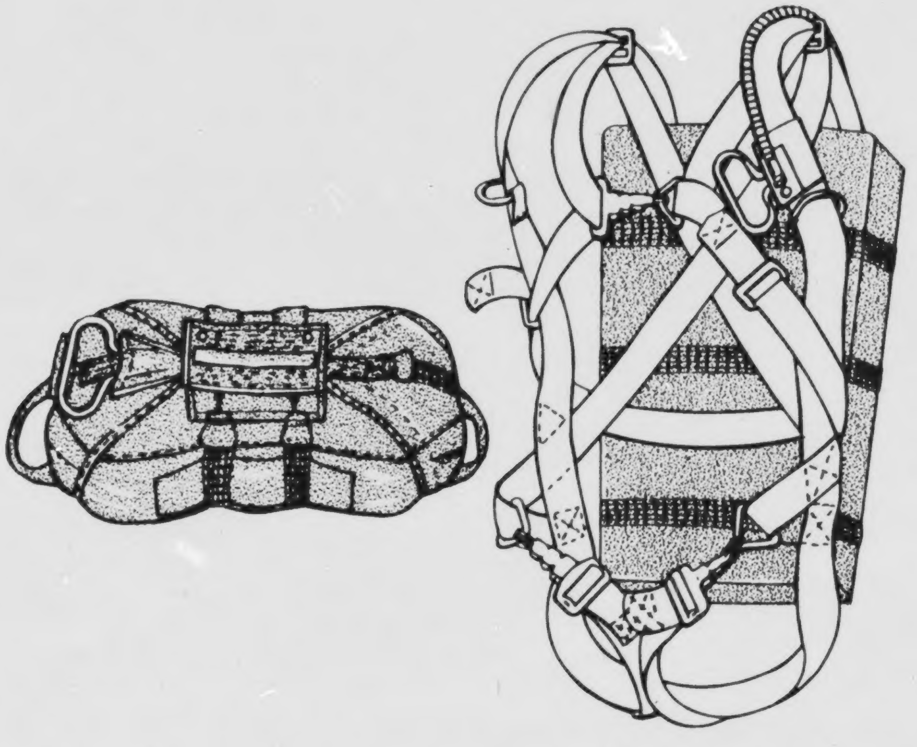
Then, with the coming of the air age in 1903, when the Wright brothers made their spectacular flight at Kitty Hawk, North Carolina, there came also an era of experimentation with parachutes designed especially for the new type of aircraft.

Captain Albert Berry is given credit for being the first American military man to successfully jump from an airplane using a parachute. This jump was made in 1912. His parachute was packed in a cone-shaped metal cylinder with a trapeze bar serving as a harness, and the weight of his body pulled the canopy from the container. Many others using makeshift or experimental parachutes made descents before World War I, but parachutes still were not considered as essential equipment for military aviators. The resultant mortality rate among pilots at the front during the war was very high. This, together with the fact that the lives of 800 balloonist observers and artillery fire directors were saved by parachutes, pointed out a desperate need for a foolproof, lifesaving device. The next logical step then, was to improve parachute reliability and make them mandatory for military aircraft.

With World War II, when the number of naval aircraft was increased tenfold, the parachute became more and more important and its improvement became an important objective of the Navy. Pursuing this objective led to the development of the Naval Aerospace Recovery Facility at El Centro, California.

This facility tests and approves any change to the parachute and/or components, and is responsible for the research and development of many items now in use.

The Naval Aerospace Recovery Facility, along with the Aerospace Crew Equipment Department at Philadelphia, Pennsylvania, enables personal survival equipment development to keep abreast of the design and development of newer and faster aircraft.



PR.109

Figure 3-1.—NT-5 personnel parachute assembly.

PRINCIPLES OF OPERATION

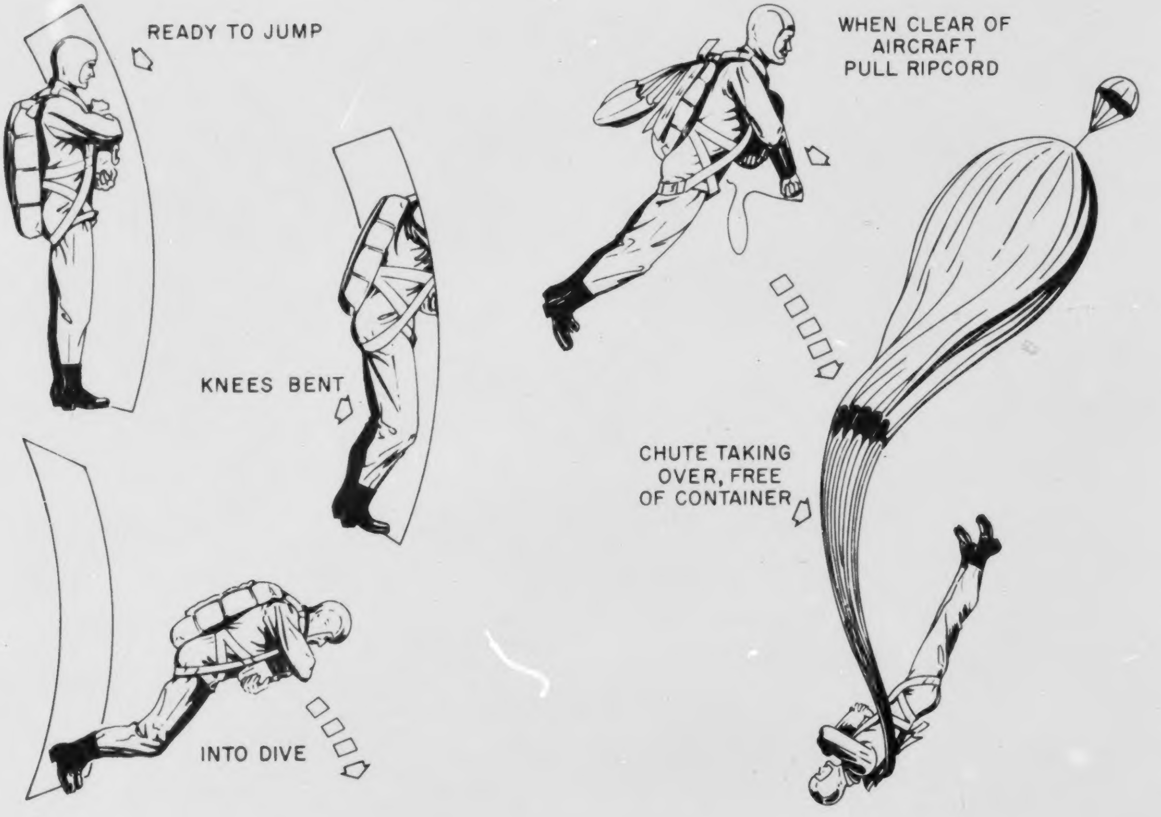
A parachute is somewhat similar to a giant umbrella in appearance. By offering a large air resisting or drag surface the parachute, when opened, provides the deceleration necessary to allow for the safe descent of an aircrewman.

For the principles of operation discussed in this section the NT-5 personnel parachute assembly will be used. (See fig. 3-1.)

The NT-5 personnel parachute assembly consists of a back type main parachute and a chest type reserve parachute as an assembly specifically designed for training purposes. The NT-5 assembly is used for premeditated training jumps only. It is available as either an NT-5"R" (regular) or an NT-5"O" (oversize), the difference being in the size of the canopy, number of suspension lines, and the size of the harness.

The NT-5"R" assembly includes a 28-foot diameter, flat, circular nylon canopy with 28 gores and a pilot parachute. The NT-5"O" main assembly includes a 32-foot diameter flat, circular nylon canopy with 32 gores and a pilot parachute. They are packed in a back type container and secured to the aircrewman's back by means of a harness assembly. The chest type reserve assembly includes a 24-foot diameter, flat circular nylon canopy with 24 gores. It is secured to the aircrewman's chest by means of the harness assembly.

In each premeditated free fall parachute jump the following sequence of events takes place. After clearing the aircraft, the manual ripcord handle is pulled. The ripcord pins are removed from the locking cones, permitting the grommets to separate from the locking cones. The container spring opening bands pull the side and


READY TO JUMP
KNEES BENT
INTO DIVE
WHEN CLEAR OF AIRCRAFT PULL RIPCORD
CHUTE TAKING OVER, FREE OF CONTAINER

PR.110

Figure 3-2.—Aircraft egress, pilot chute deployed, and main canopy free of container.

end flaps apart allowing the pilot chute to spring beyond the negative pressure area immediately above the falling body. This results in its getting a better "bite" on the surrounding air, thus speeding the opening of the canopy.

The parachutist falling away from the pilot parachute causes the main canopy to be pulled from the container assembly, followed by the suspension lines. The canopy begins to fill with air during this operation. This series of events is illustrated in figure 3-2.

The ties on the risers will break as the load is applied. The lift webs are then pulled from the container while the canopy fully opens; at this point the parachutist will receive the parachute opening shock. The aircrewman then hangs or sits suspended in his harness during the descent. If the main parachute assembly malfunctions, the emergency (chest type reserve) parachute assembly is deployed.

At approximately 100 feet from the ground, all preparations for landing should have been completed.

For correct body positioning in preparation for landing, the feet and legs should be together, toes pointed downward slightly, arms stretched upward, and the hands grasping the risers. Knees should be bent slightly and the aircrewman should look forward, not at the ground, because of a tendency to pick up or raise his feet just

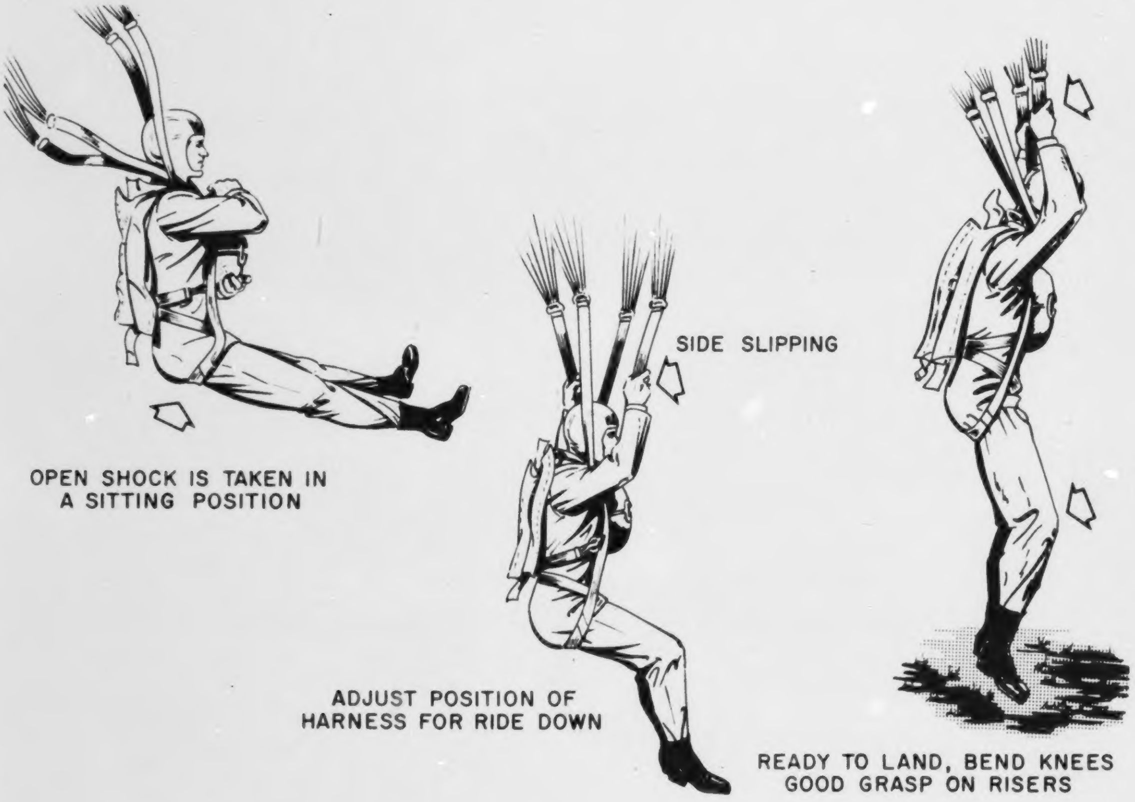

OPEN SHOCK IS TAKEN IN A SITTING POSITION
SIDE SLIPPING
ADJUST POSITION OF HARNESS FOR RIDE DOWN
READY TO LAND, BEND KNEES GOOD GRASP ON RISERS
PR.111

Figure 3-3.—Opening shock, harness position, and landing preparation.

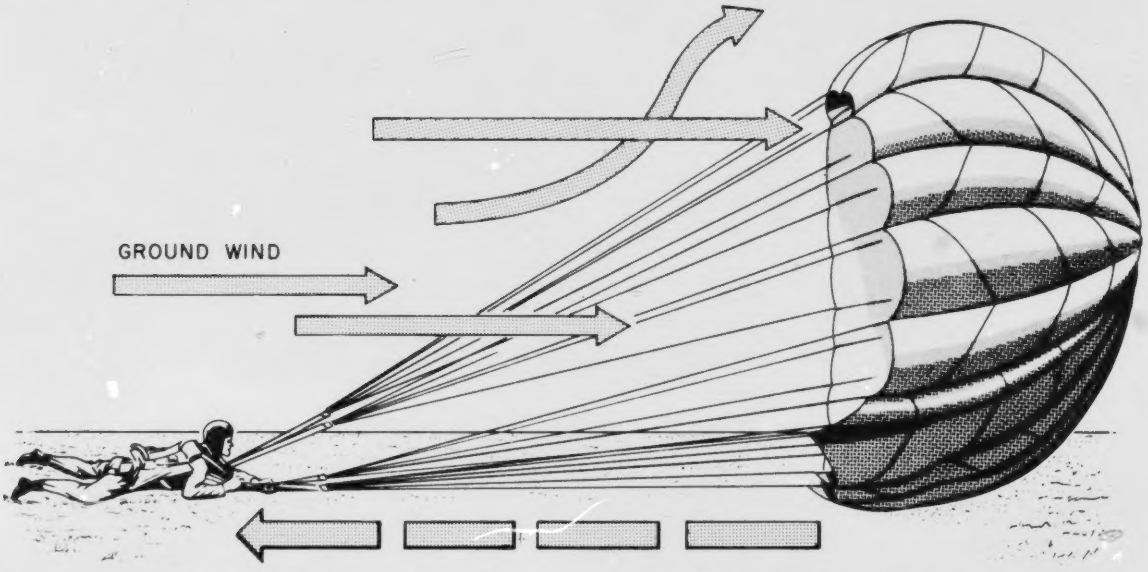
before he lands, which could cause serious injury to the legs or back. (See fig. 3-3.)

If possible, land facing the direction of your drift but do not continue attempts to manipulate the canopy below 100 feet altitude. Land evenly on the balls of the feet with the knees slightly bent. Place the chin on the chest and pivot the body slightly to the right or left, as appropriate. Complete the tumble getting as much of the body on the deck as possible to better absorb landing impact. Do not attempt to break a fall by use of the hands, knees, elbows, etc., since they are susceptible to injury.

Upon completion of the landing fall, quickly get to your feet if possible, and proceed with the collapsing of the parachute canopy. Run toward the canopy and then around to the leeward (downwind) side. This will spill the air from the canopy, causing it to collapse. Lie down on the parachute canopy on your back and remove your harness. If the wind is blowing too hard to use this method, roll on your stomach immediately after completing the landing fall and start pulling the suspension lines nearest the ground toward you as shown in figure 3-4. This will also cause the air to spill from the canopy and it will collapse.

DESIGN AND CONSTRUCTION

A parachute assembly consists of five major components: the pilot chute, the canopy,



PULL SHROUD LINES NEAREST GROUND EMPTYING AIR IN CANOPY
AND COLLAPSE CHUTE
(ONLY A FEW LINES ARE NEEDED;
PULL THE GROUP IN, HAND OVER HAND)

PR.112

Figure 3-4.—Collapsing the canopy.

the suspension lines, the container, and the harness.

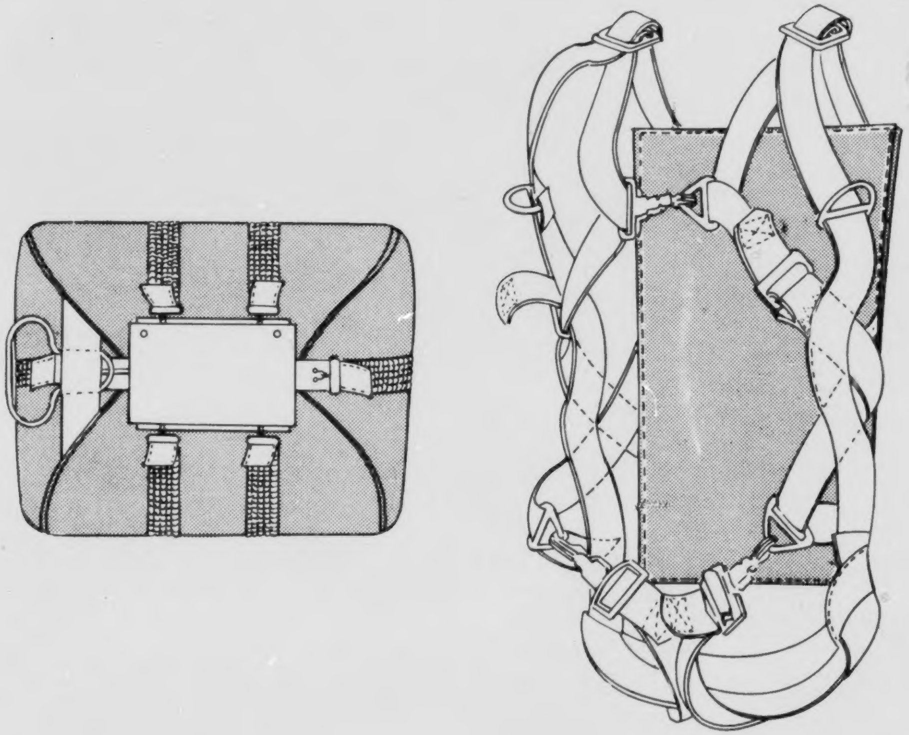
The pilot chute is a small parachute attached to the top of the main canopy. Its purpose is to assist in retarding the main canopy while the weight of the falling aircrewman withdraws the suspension lines from the container so that the canopy can inflate with air. The canopy is a large surface area of cloth which establishes a safe rate of descent for the aircrewman. The suspension lines are strong lines containing some elasticity; they are used for joining the canopy to the harness. The container is an assembly which encloses the pilot chute, canopy, and suspension lines. In some configurations of parachute assemblies the container will enclose additional equipment and/or other appendages. The harness is an arrangement of nylon webbing and metal fittings. It is designed to hold the canopy securely to the jumper and provide a seat or sling during descent.

For more detailed information on specific parachute assembly configuration, refer to NavAir 13-1-6.2 or the appropriate top assembly drawing. NavAir 13-1-6.2.1, under preparation, when issued will be the IPB for all parachute assemblies.

TYPES OF PARACHUTES

At the time of this writing there are approximately 28 different types and/or configurations of parachute assemblies in the Navy's inventory. All of these parachute assemblies are discussed in great detail in the Parachutes Manual, NavAir 13-1-6.2.

This chapter covers some of the same material, but no attempt will be made in this manual to cover all of the parachute assemblies. Although the chapter does touch upon a number of the parachutes to a limited extent, the discussion is confined to the general scope and application of



PR.113

Figure 3-5.—NC-3 personnel parachute assembly.

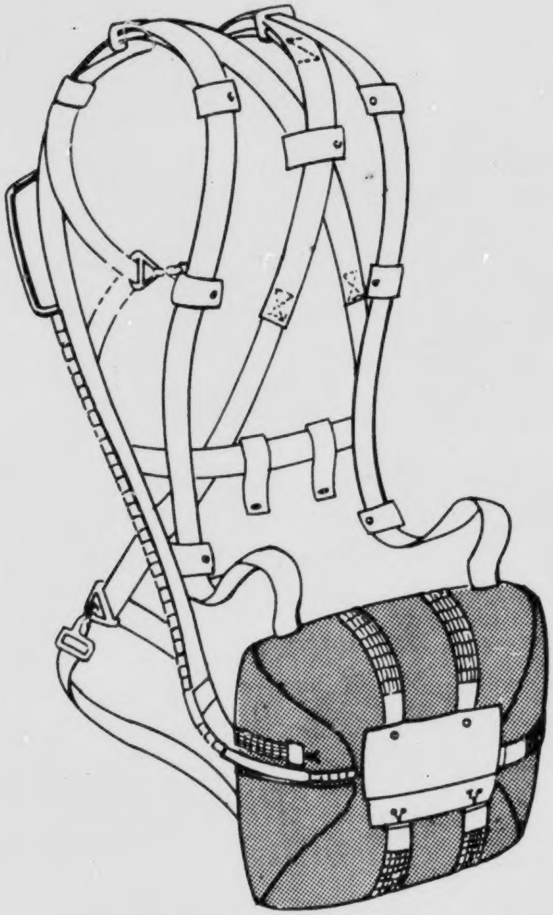
some assemblies. For those interested, much additional information can be obtained from NavAir 13-1-6.2.

There are several basic types of parachutes now in service use by the Navy. Among these are the Navy chest type (NC), the Navy seat type (NS), and the Navy back type (NB). All Navy parachutes are placed in one or the other of these categories. An oversize harness may be used with the NS type parachute; therefore, the letter "R" indicating regular size harness, or the letter "O" indicating an oversize harness, is also included after the model number as a part of the letter designation; i.e., NS-3R.

Navy Chest Type Parachute

The Navy chest type parachute (NC-3) is used primarily in transport and patrol type aircraft. The parachute is secured to the aircrewman's chest by means of a harness assembly using quick connector hardware. (See fig. 3-5.)

The NC-3 was designed for use in an aircraft where duties of the pilot and crewman require them to have freedom of movement in various sections of the aircraft. When the chest type parachute is used it is usually stored in a spot near the individual's flight station or bailout station, allowing maximum efficiency of the crewman and still providing a high degree of safety. This accessibility of the parachute allows attachment of the chute to the harness before bailing out. All crewmen must be familiar with the location and use of the type parachute provided and with the bailout procedures for the aircraft in which embarked.



PR.114

Figure 3-6.—Basic NS-3 personnel parachute assembly.

Navy Seat Type Parachute

The seat type parachute (fig. 3-6) is the oldest type still in service use. It is designed to be worn as a seat for the wearer, and when in use, fits in the bucket section of the aircraft seat.

The NS-3 assembly includes a 28-foot diameter, flat, circular, nylon canopy with 28 gores. The canopy is packed in a container and secured under the aircrewman's buttocks by means of a harness assembly.

Six different configurations of the NS-3 assembly could be used in service. These configurations are as follows:

1. The basic NS-3 assembly with seat cushion.
2. The NS-3 assembly with seat cushion and standard soft pack.
3. The NS-3 assembly with a seat pan.
4. The NS-3 assembly with a seat pan and standard soft pack.
5. The NS-3 assembly with an automatic actuator installed.
6. The NS-3 assembly with a seat pan and LRU-7/P one man raft installed.

The standard soft pack is one of several types of packaged one man raft assemblies. For proper application of the NS-3 parachutes refer to NavAir 13-1-6.2.

Navy Back Type Parachute

The Navy back type parachute is secured to the aircrewman's back by means of a harness assembly. There are various configurations of the back type parachute. Some models are used in cargo/passenger type aircraft while other designs are ideally suited for use in jet-powered aircraft, their ejection seats, and automatic devices.

Some back type parachutes used in ejection seat escape systems are designed to be worn with the integrated torso suit harness. The torso harness combines the aircrewman's parachute harness and lap and shoulder restraint straps.

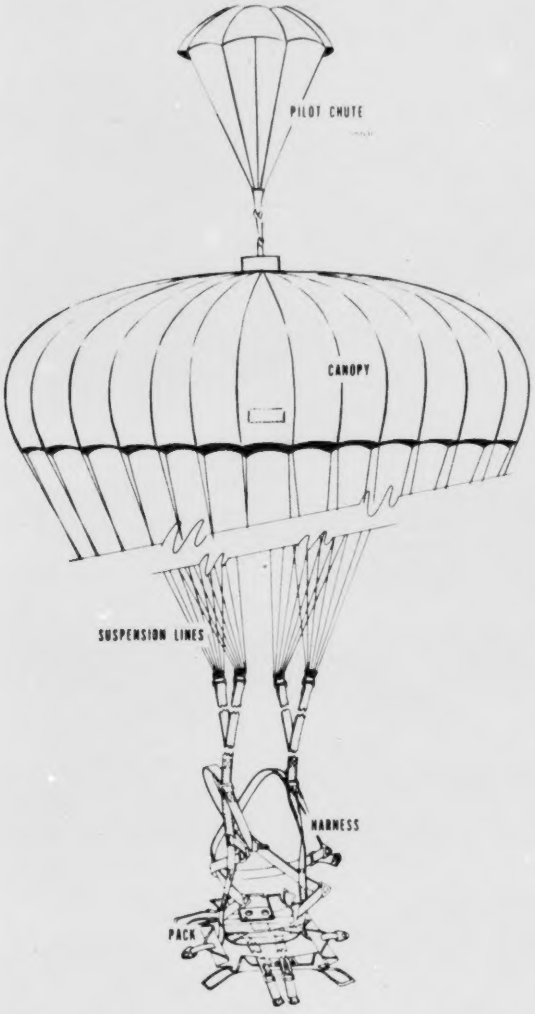
Martin-Baker Parachute Assemblies

Another type of integrated parachute designed for use with ejection seats is the Martin-Baker. These assemblies have a 24-foot diameter canopy and when configured with the Martin-Baker ejection seat they combine to form the Martin-Baker Escape Unit (MBEU) and carry an NES designator.

The Martin-Baker parachute assemblies will be covered in more detail in chapter 8 of this training manual.

NES-8B Parachute Assembly

The NES-8B personnel parachute assembly is designed for use with an integrated torso harness



PR.120

Figure 3-7.—The five major parts of a parachute.

suit and is part of the ejection seat escape system. The NES-8B parachute is an aircraft inventory item. The assembly includes a multicolored, 28-foot diameter, flat, circular nylon canopy with 28 gores and a pilot parachute. The canopy is packed in a hardshell horseshoe type container and installed in the ejection seat. The integrated torso harness suit combines the aircrewman's parachute harness and lap and shoulder restraint straps. The survival kit is also connected to the integrated torso suit by means of quick release fittings.

LW-3B Personnel Parachute Assembly

The LW-3B personnel parachute assembly is used with an integrated torso harness suit as part of an ejection seat escape system. The assembly is mounted on the back of the ejection seat on the left side for the LW-3B-1 assembly and on the right side for the LW-3B-2 assembly. The LW-3B assembly is an aircraft inventory item.

The LW-3B assembly includes a 28-foot diameter, flat, nylon canopy with 28 gores. The canopy is packed in a metal based fabric container.

The integrated torso harness suit combines the aircrewman's parachute harness and lap and shoulder restraint straps. The survival kit is also connected to the integrated torso suit by means of quick release fittings.

There are two authorized configurations of the LW-3B assembly presently in use: The LW-3B-1 assembly is used with the pilot's seat and the LW-3B-2 assembly is used with the observer's seat.

High Altitude Low Opening (HALO) Parachute Assembly

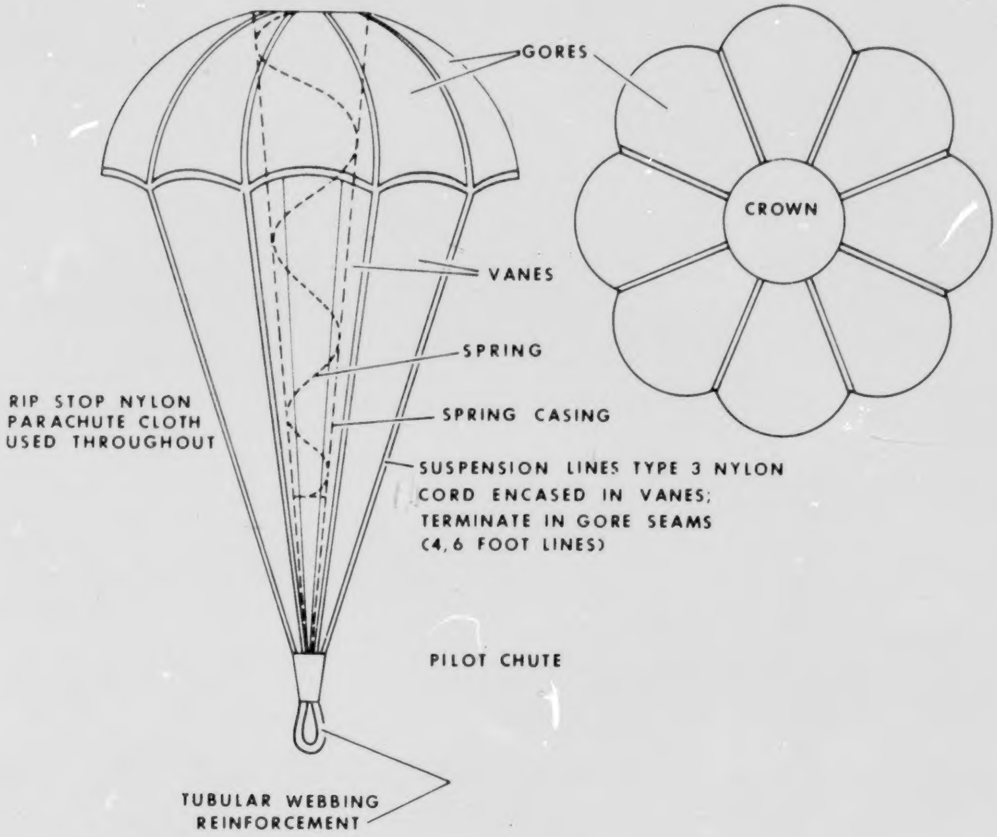
The high altitude low opening parachute assembly is a back type parachute designed for high altitude free-fall and low opening. The HALO assembly includes a 35-foot diameter, parabolic, nylon canopy with 30 gores. The canopy is packed in a container and secured to the aircrewman's back by means of a harness assembly.

The assembly also includes a parachutist's kit and a chest type reserve parachute.

The HALO parachute assembly is used primarily for premeditated jumps over designated areas where pinpoint landings are necessary. Free-fall parachuting allows greater maneuverability and landing accuracy.

T-10 Personnel Parachute Assembly

The T-10 parachute is a back type parachute designed for static line operation only. The


GORES
CROWN
VANES
SPRING
SPRING CASING
RIP STOP NYLON PARACHUTE CLOTH USED THROUGHOUT
SUSPENSION LINES TYPE 3 NYLON CORD ENCASED IN VANES; TERMINATE IN GORE SEAMS (4, 6 FOOT LINES)
PILOT CHUTE
TUBULAR WEBBING REINFORCEMENT

PR.121

Figure 3-8.—The vane type pilot chute.

assembly includes a 35-foot diameter, parabolic, nylon canopy with 30 gores. The T-10 parachute assembly is used during special operations and for premeditated jumps over a designated area.

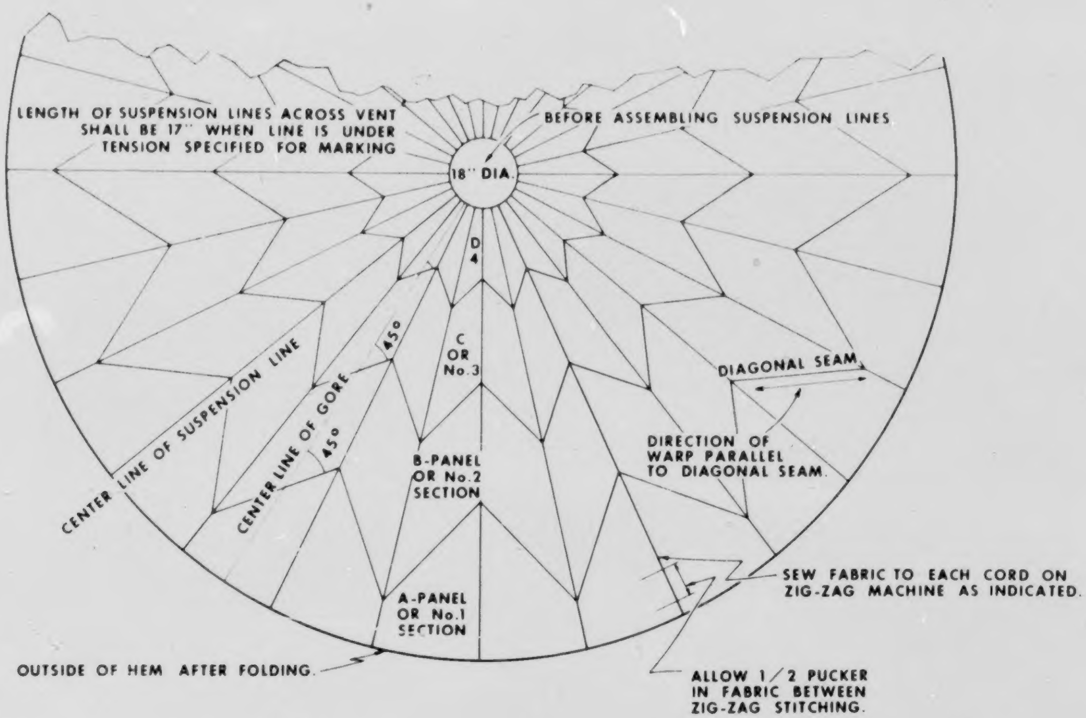
COMPONENTS OF PARACHUTES

The design and construction of a parachute and its components are based on the old idea that a chain is only as strong as its weakest link. Every link from the jumper to the canopy must carry its share of the maximum load applied during the opening shock.

The five major parts of a standard service parachute, starting at the top and working down, are the pilot chute, main canopy, suspension lines, harness, and pack. Figure 3-7 illustrates these five major parts.

PILOT CHUTE

The vane type pilot chute is used on all Navy parachutes except the Martin-Baker parachute. Figure 3-8 shows the nomenclature or names of parts and materials that make up a pilot chute. A thorough knowledge of this nomenclature will prove invaluable in your future work with parachutes.


LENGTH OF SUSPENSION LINES ACROSS VENT SHALL BE 17" WHEN LINE IS UNDER TENSION SPECIFIED FOR MARKING
BEFORE ASSEMBLING SUSPENSION LINES
18" DIA.
D 4
C OR No.3
45°
45°
CENTER LINE OF SUSPENSION LINE
CENTER LINE OF GORE
DIAGONAL SEAM
DIRECTION OF WARP PARALLEL TO DIAGONAL SEAM
B-PANEL OR No.2 SECTION
A-PANEL OR No.1 SECTION
SEW FABRIC TO EACH CORD ON ZIG-ZAG MACHINE AS INDICATED.
OUTSIDE OF HEM AFTER FOLDING.
ALLOW 1/2 PUCKER IN FABRIC BETWEEN ZIG-ZAG STITCHING.

PR.122

Figure 3-9.—The 28-foot ripstop canopy.

CANOPIES

The size and shape of the parachute canopy have been controversial subjects since da Vinci envisioned a pyramid of cloth as being a safe way of falling through the air. After experimentation with many different canopies over the years, two shapes have emerged as acceptable. One is the standard flat design which has remained virtually unchanged for the past 30 years. The second is a new idea in construction, but still follows the basic shape pattern. This latter canopy type is known as the 26-foot 22-gore conical canopy. This canopy is used with the NB-6 parachute assemblies. The "conical" reference comes from the fact that the peak of the canopy is conical in construction. In descent the canopy presents a slightly raised shape at the apex, but fails to radically change the basic appearance so familiar to the service.

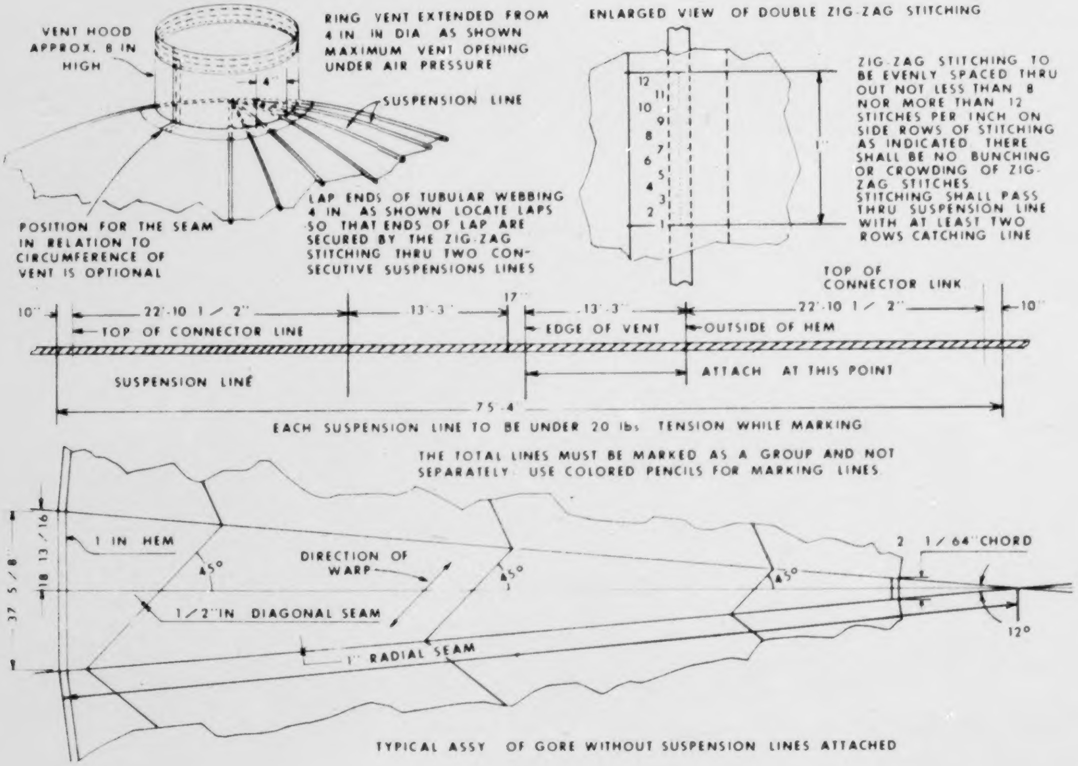
Standard Flat Type

The 28-foot ripstop nylon canopy is the old standard size used on all Navy parachutes. The parachute canopy is described as a polygon, having 28 sides, a diameter of 28 feet plus or minus 1 inch, and 28 gores of 4 sections each.

The 28-foot canopy contains approximately 796 square feet of nylon cloth plus 2,400 yards of nylon thread. The sewing on a parachute varies from 8 to 11 stitches per inch. The parachute contains approximately one-half million stitches.

The suspension lines run continuously from the connector link on one side of the 28-foot canopy to the connector link on the other side as illustrated in figures 3-9 and 3-10.

The following additional items concerning the standard flat canopy should be noted:


VENT HOOD APPROX. 8 IN HIGH
RING VENT EXTENDED FROM 4 IN IN DIA AS SHOWN MAXIMUM VENT OPENING UNDER AIR PRESSURE
4"
SUSPENSION LINE
POSITION FOR THE SEAM IN RELATION TO CIRCUMFERENCE OF VENT IS OPTIONAL
LAP ENDS OF TUBULAR WEBBING 4 IN AS SHOWN LOCATE LAPS SO THAT ENDS OF LAP ARE SECURED BY THE ZIG-ZAG STITCHING THRU TWO CONSECUTIVE SUSPENSIONS LINES
ENLARGED VIEW OF DOUBLE ZIG-ZAG STITCHING
12
11
10
9
8
7
6
5
4
3
2
1
1"
ZIG-ZAG STITCHING TO BE EVENLY SPACED THRU OUT NOT LESS THAN 8 NOR MORE THAN 12 STITCHES PER INCH ON SIDE ROWS OF STITCHING AS INDICATED THERE SHALL BE NO BUNCHING OR CROWDING OF ZIG-ZAG STITCHES STITCHING SHALL PASS THRU SUSPENSION LINE WITH AT LEAST TWO ROWS CATCHING LINE
TOP OF CONNECTOR LINK
10"
22'-10 1/2"
13'-3"
17"
13'-3"
22'-10 1/2"
10"
TOP OF CONNECTOR LINE
EDGE OF VENT
OUTSIDE OF HEM
SUSPENSION LINE
ATTACH AT THIS POINT
75'-4"
EACH SUSPENSION LINE TO BE UNDER 20 lbs TENSION WHILE MARKING
THE TOTAL LINES MUST BE MARKED AS A GROUP AND NOT SEPARATELY USE COLORED PENCILS FOR MARKING LINES
37 5/8"
18 13/16
1 IN HEM
45°
DIRECTION OF WARP
45°
45°
1/2"IN DIAGONAL SEAM
1" RADIAL SEAM
2 1/64" CHORD
12°
TYPICAL ASSY OF GORE WITHOUT SUSPENSION LINES ATTACHED

PR.123

Figure 3-10.—The 28-foot ripstop canopy gore.

1. Each gore is composed of four sections identified by the letters A, B, C, and D, starting with the bottom section.

2. Diagonal seams run parallel to the warp thread in the cloth, the warp changing direction with each gore. The sections are cut at a 45-degree angle to the centerline of the gore. This is called BIAS CONSTRUCTION and provides the maximum strength and elasticity.

3. The radial and diagonal seams are double lapped for security.

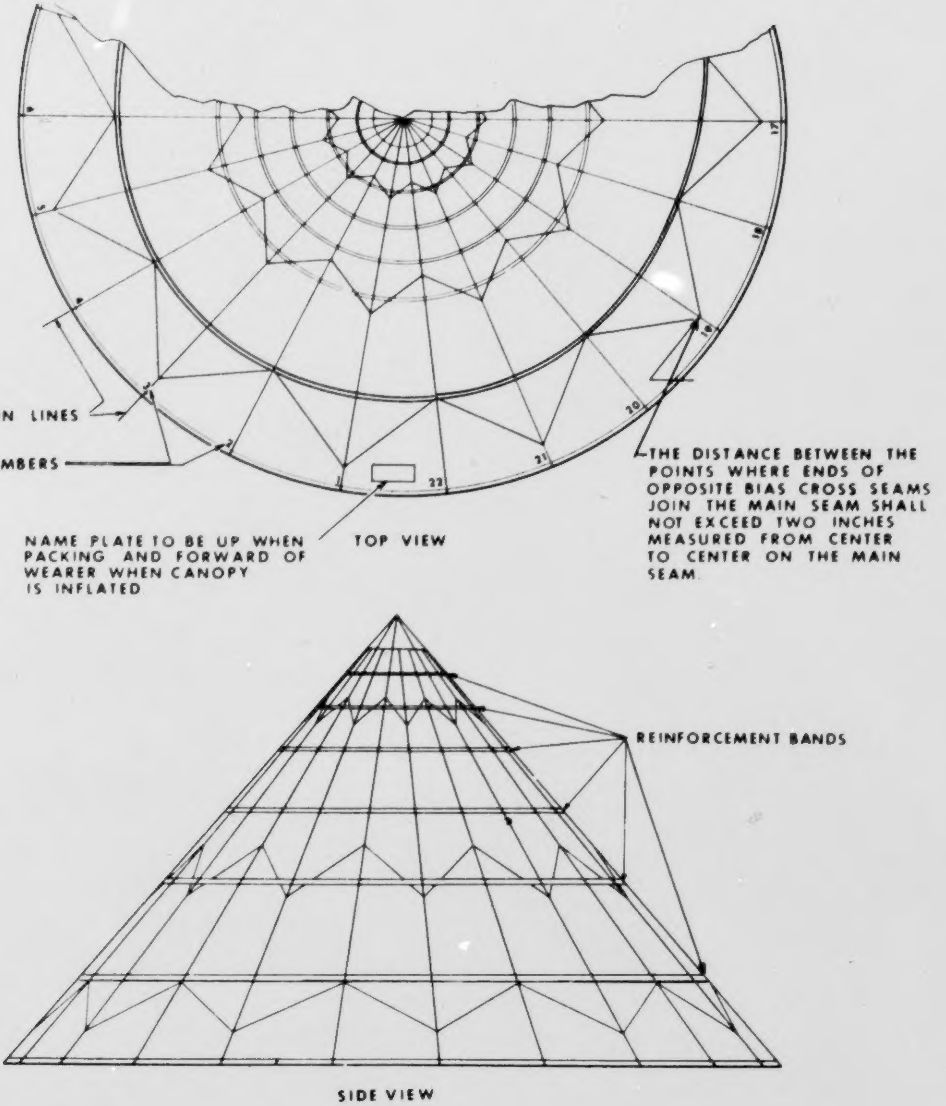
4. The suspension lines are enclosed in the channel produced by stitching the radial seams.

5. The vent acts as a relief valve and relieves the high internal pressure within the parachute at the instant of opening. Without this vent, an opening at high speed could result in a dangerous rupture of the canopy.

6. The skirt and vent hems are reinforced with 1-inch tubular nylon webbing to aid in preventing tears from completely separating the canopy.

7. The following is stenciled on the top center gore (section A of gore number 28) in letters 1/2 inch high and approximately 12 inches from the bottom of the canopy:

NAVAIRFAC
ORDER NO.
DATE OF MANUFACTURE AND SERIAL NO.
MANUFACTURER'S NAME OR TRADE MARK


SUSPENSION LINES
GORE NUMBERS
TOP VIEW
1
2
3
5
17
18
19
20
21
22
REINFORCEMENT BANDS
SIDE VIEW

NAME PLATE TO BE UP WHEN PACKING AND FORWARD OF WEARER WHEN CANOPY IS INFLATED

THE DISTANCE BETWEEN THE POINTS WHERE ENDS OF OPPOSITE BIAS CROSS SEAMS JOIN THE MAIN SEAM SHALL NOT EXCEED TWO INCHES MEASURED FROM CENTER TO CENTER ON THE MAIN SEAM.

PR.124

Figure 3-11.—Conical canopy, 26 foot, 22 gore.

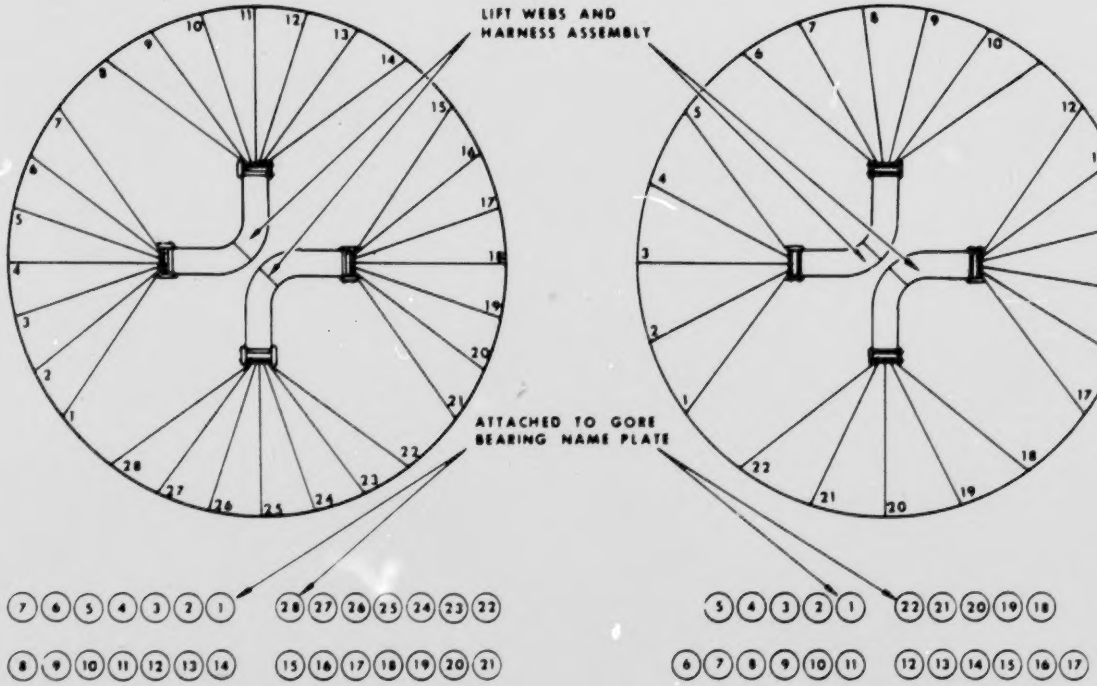
Stenciled on the diametrically opposite gore (section A of gore number 14) is found the following:

DATE OF MANUFACTURE
AND SERIAL NO.

8. All marking fluid used should be in accordance with Specification MIL-I-6903A, amendment No. 1.

9. All machine stitching, except zigzag, should conform to Type 301, Federal Standard 751, and should be not less than 8 nor more than 11 stitches per inch.

10. Ends of all tape, webbing, and lines must be seared to prevent fraying. No waxes should be used.


LIFT WEBS AND HARNESS ASSEMBLY
ATTACHED TO GORE BEARING NAME PLATE
7 6 5 4 3 2 1
28 27 26 25 24 23 22
8 9 10 11 12 13 14
15 16 17 18 19 20 21
5 4 3 2 1
22 21 20 19 18
6 7 8 9 10 11
12 13 14 15 16 17

PR.125

Figure 3-12.—Suspension line arrangement.

11. For sewing diagonal seams, either size B or E nylon thread may be used. Use size E thread for all other seams, zigzag stitching, and repairs.

12. Removable connector links provide a quick attachment of the canopy and suspension lines to the harness.

Conical Canopy

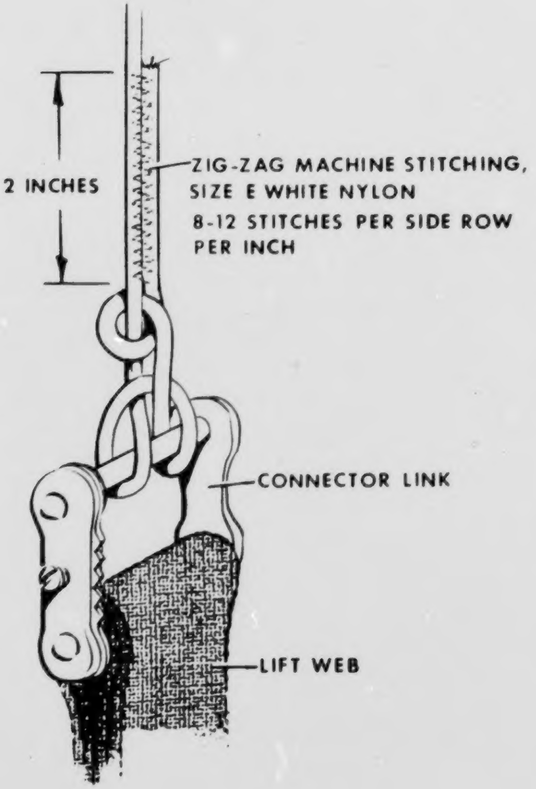
Figure 3-11 illustrates the conical canopy. It has a slightly higher average rate of descent (22 feet per second) than the 28-foot canopy, but is reduced in bulk.

Note the following construction differences:

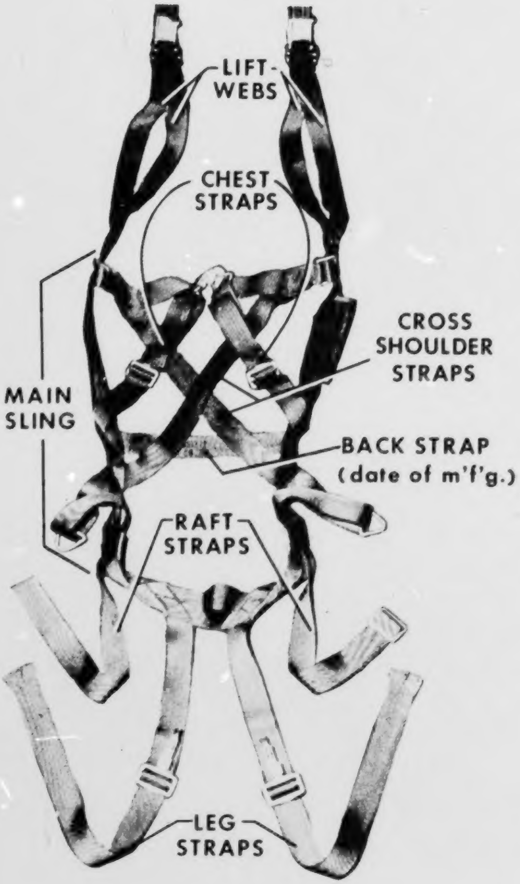
1. Shape.
2. Suspension lines are anchored to the canopy at the skirt and are not continuous from link to link. This reduces the bulkiness of the parachute.
3. Reinforcing bands of tape are located around the circumference.
4. The conical canopy does not have a vent collar, but does have a vent cover.
5. There are 22 gores, the joining of which requires fewer seams and is less bulky.
6. The rate of descent has been sacrificed to a certain degree in order to increase the strength and stability of the parachute.

SUSPENSION LINES

The suspension lines form a net or skeleton for the canopy and absorb much of the shock load. They must therefore be placed under a 20-pound tension, marked, and cut as a group to assure equal distribution of the shock load.


2 INCHES
ZIG-ZAG MACHINE STITCHING, SIZE E WHITE NYLON
8-12 STITCHES PER SIDE ROW PER INCH
CONNECTOR LINK
LIFT WEB

PR.126
Figure 3-13.—Method of attaching suspension lines at the link.


LIFT-WEBS
CHEST STRAPS
CROSS SHOULDER STRAPS
MAIN SLING
BACK STRAP (date of m'f'g.)
RAFT STRAPS
LEG STRAPS

PR.127
Figure 3-14.—Back type quick-fit parachute harness.

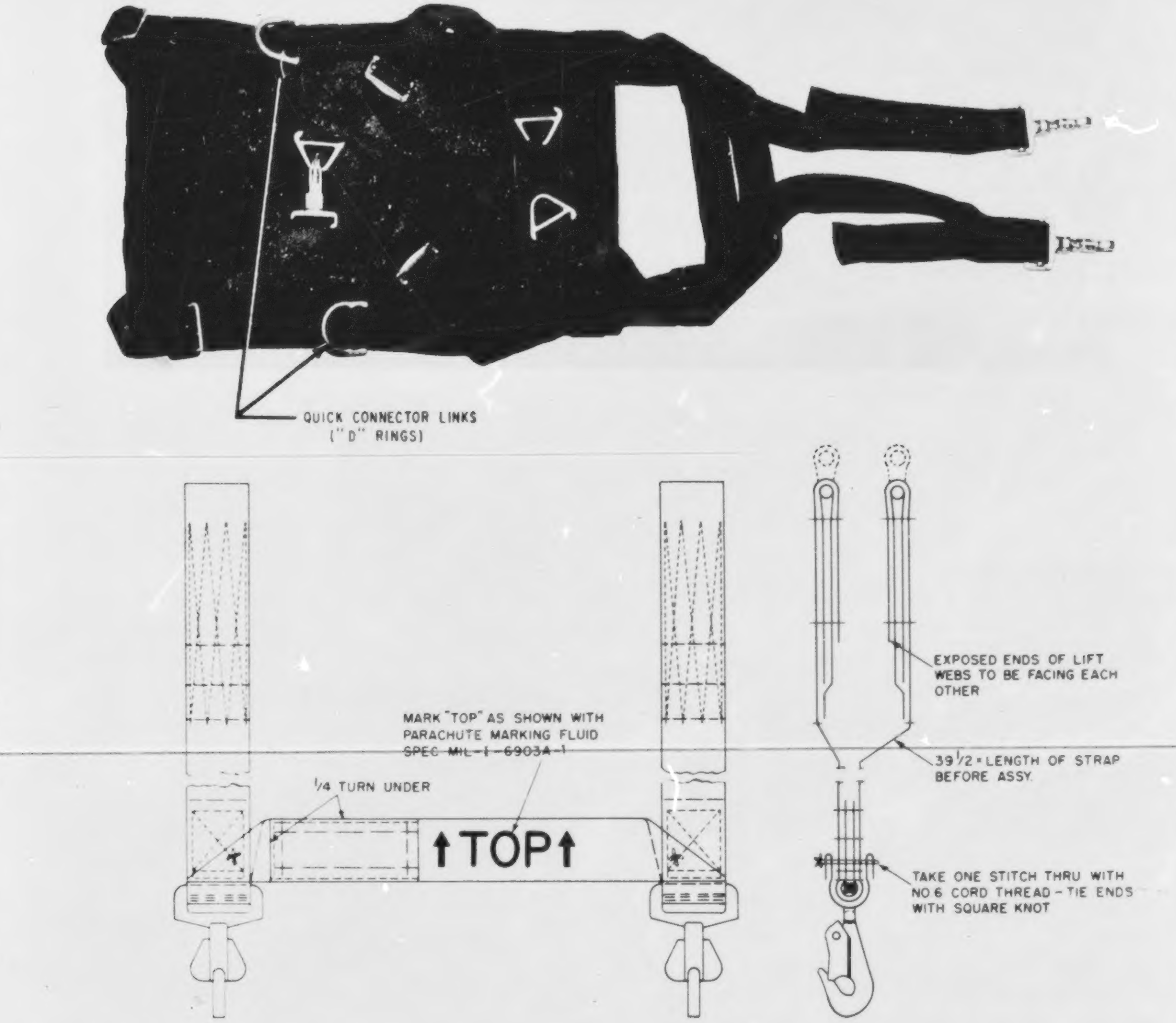
The 28 suspension lines counted at the links are actually 14 lines, 75 feet 4 inches in length. These lines run continuously from link to link; that is, each line is secured to a connector link on one side of the canopy, runs up and over the canopy, and down to a link on the opposite side.

Type III nylon suspension line is used on all main canopies and vane type pilot chutes. This line consists of a loosely woven outer covering called a sleeve, and several strong inner cords called the core. This core provides the greater portion of the strength of the suspension line.

Figure 3-12 illustrates the arrangement of the suspension lines on both the 28-foot and the 26-foot canopies. On the 28-foot canopy the lines are arranged in four groups of 7 lines each, while on the 26-foot canopy they are arranged in two groups of 5 and two groups of 6 lines each.

The suspension lines are attached to the connector links by tying a clove hitch, a half-hitch, and completing the attachment with 2 inches of zigzag stitching. This attachment is shown in figure 3-13.

To prevent the canopy on the 28-foot parachute from slipping along the suspension lines, each line is anchored by zigzag stitching at several points to the radial seams through which it passes. One-half inch of slack is allowed in the


QUICK CONNECTOR LINKS
("D" RINGS)
MARK "TOP" AS SHOWN WITH PARACHUTE MARKING FLUID SPEC MIL-I-6903A-1
1/4 TURN UNDER
↑TOP↑
EXPOSED ENDS OF LIFT WEBS TO BE FACING EACH OTHER
39 1/2 = LENGTH OF STRAP BEFORE ASSY.
TAKE ONE STITCH THRU WITH NO 6 CORD THREAD - TIE ENDS WITH SQUARE KNOT

PR.128

Figure 3-15.—Chest type harness and lift web assembly.

vicinity of the skirt between the zigzag sewing points to relieve the strain during opening shock.

PARACHUTE HARNESS

Parachute harnesses are designed to secure the parachute to the wearer and provide support during opening shock and descent. The harnesses currently being used by the Navy are the quick fit (so called because of the ease and speed with which they may be adjusted by the wearer) and the integrated torso harness.

The integrated torso harness combines parachute harness, lap belt, and shoulder harness into one integrated garment which improves comfort, mobility, and retention, and is easier to don and remove. It also reduces the number of exposed straps and overall bulk and weight. This harness is discussed in detail in chapter 14.

The parts of the parachute harness which take the load during a descent are nylon webbing of a soft weave, conforming to Specification MIL-W-4088D, and metal fittings of alloy steel which are proof loaded in accordance with applicable standard drawings.

The standard quick-fit harness is made in three configurations–seat type, back type, and chest type. The seat and back types are the same in design construction except that the seat type requires lift webs of greater length to compensate for difference in the location of the packs. The main parts of these harnesses are the combined main suspension sling and lift webs, leg straps, horizontal backstrap, diagonal backstrap (or cross shoulder strap), and chest straps. (See fig. 3-14.)

The principal difference between the chest type and the seat or back type harness is that on the NC-3 harness the lift webs separate from the main suspension sling at a point near the chest on each side of the body. This is accomplished by the incorporation of two D-rings in the harness sling and two connector snaps in a separate lift web assembly.

The lift web assembly consists of two equal length straps each laced through the webbing slot of a connector snap. The connector snap is located at the middle of each strap, which is folded back and sewn together just above the snap. The loose ends of each are sewn to individual links connecting to the canopy. Two connector snaps are joined by a cross-connector strap which prevents collapse of the canopy in the event that only one snap is attached to the harness D-ring. The lift web is tacked to the pack with cord which breaks when the canopy inflates and allows the pack to break away. The chest type harness and the lift web assembly are illustrated in figure 3-15.

The date of manufacture (month and year) should be stamped with black washproof ink, TT-I-542, in letters 1/2 inch high on either the inside of the horizontal backstrap or on the inside of the sling. All exposed ends of webbing should be seared to prevent fraying; and unless otherwise specified, all machine stitching is to be 6-cord sage green nylon thread with not less than 4 nor more than 6 stitches per inch. Ends of all stitching should be backstitched a distance of not less than 1/2 inch.

PARACHUTE CONTAINER

The parachute container is designed to house and protect the pilot chute, main canopy, and suspension lines. It is made of type II nylon fabric, conforming to Specification MIL-C-7219B, amendment 1. The outside covering of the NC-3 container is cut in one piece on the bias. This is necessary to provide adequate elasticity for the pack. The machine stitching on the container is made with type E nylon thread, 6 to 8 stitches to the inch.

Figures 3-16 through 3-18 illustrate the three general types of containers used with the standard service type parachutes.

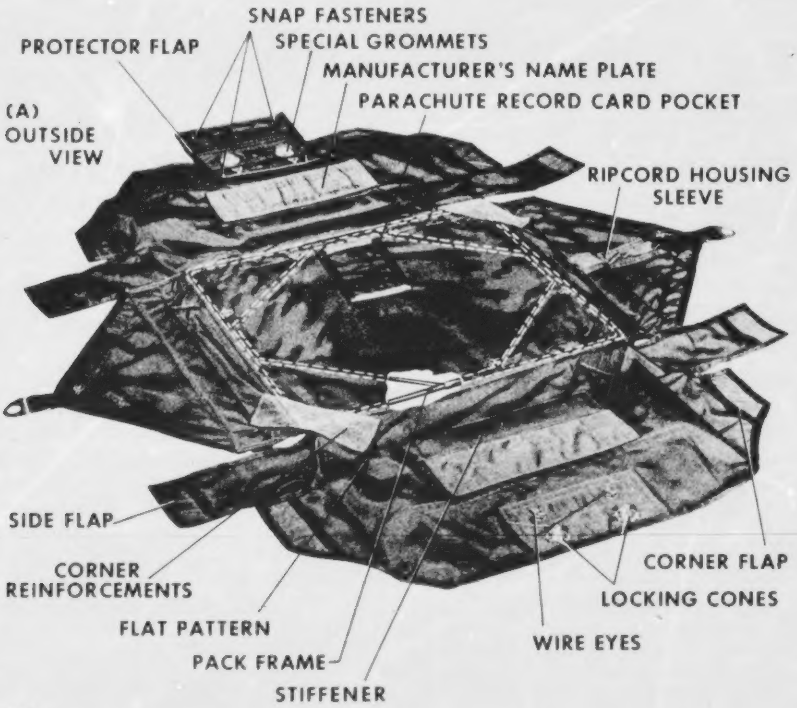
Additional information on the material used in this work may be found in NavAir and Air Force publications, along with Military and Federal Specifications. Frequent reference to these publications is necessary to keep your technical knowledge up to date.

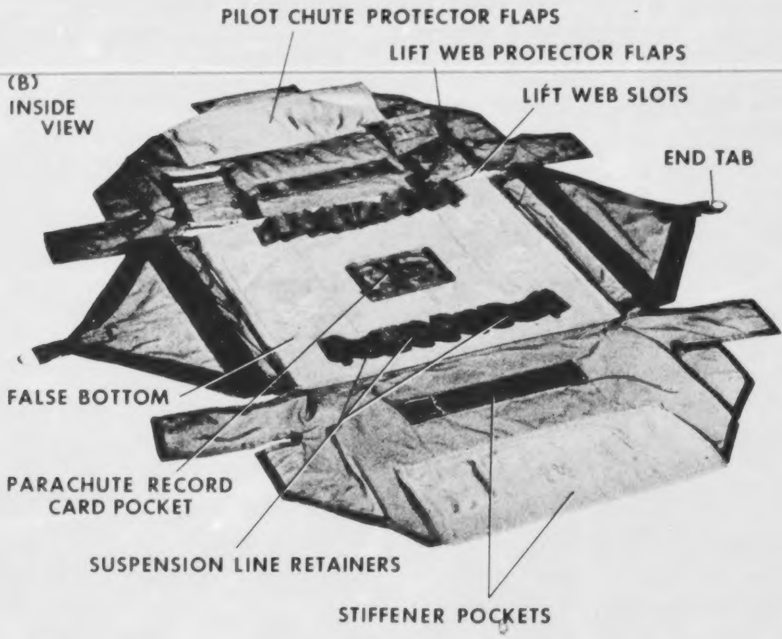
RIPCORDS

The ripcord is a manual releasing device, used to release the canopy from the container. It consists of locking pins securely attached to a length of 3/32-inch diameter corrosion-resistant steel cable. The ripcord handles are made of steel tubing in the shape of a cloverleaf or a trapezoid, and are attached by passing the cable through a small hole drilled in the grip and then swaging a retaining ball or clamping a small sleeve onto the loose end of the cable. The pins are swaged in place and tested to withstand a pull of 300 pounds.

An extensible ripcord is shown in figure 3-19. This type is used with the seat type parachute and makes changing to or from the pararaft easier by eliminating the need of changing to longer or shorter ripcords.

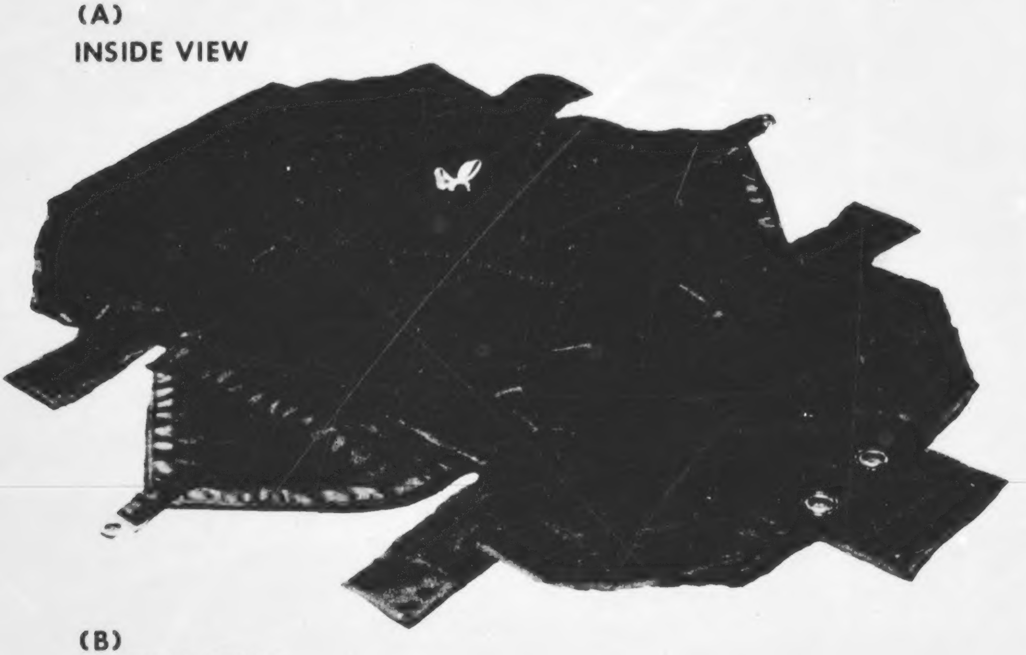
The ripcord housing consists of a flexible steel tube affixed to the parachute container at one end and to the main sling on the left side of the harness at the other. It is provided to house


SNAP FASTENERS
PROTECTOR FLAP
SPECIAL GROMMETS
MANUFACTURER'S NAME PLATE
PARACHUTE RECORD CARD POCKET
(A)
OUTSIDE
VIEW
RIPCORD HOUSING
SLEEVE
SIDE FLAP
CORNER
REINFORCEMENTS
CORNER FLAP
LOCKING CONES
FLAT PATTERN
WIRE EYES
PACK FRAME
STIFFENER


PILOT CHUTE PROTECTOR FLAPS
LIFT WEB PROTECTOR FLAPS
(B)
INSIDE
VIEW
LIFT WEB SLOTS
END TAB
FALSE BOTTOM
PARACHUTE RECORD
CARD POCKET
SUSPENSION LINE RETAINERS
STIFFENER POCKETS

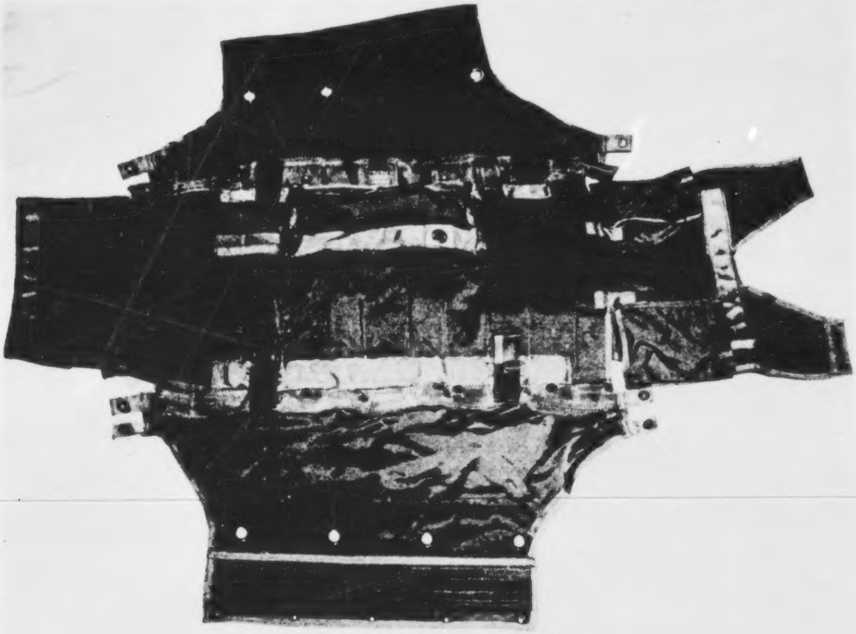
PR.129

Figure 3-16.—Seat type container.

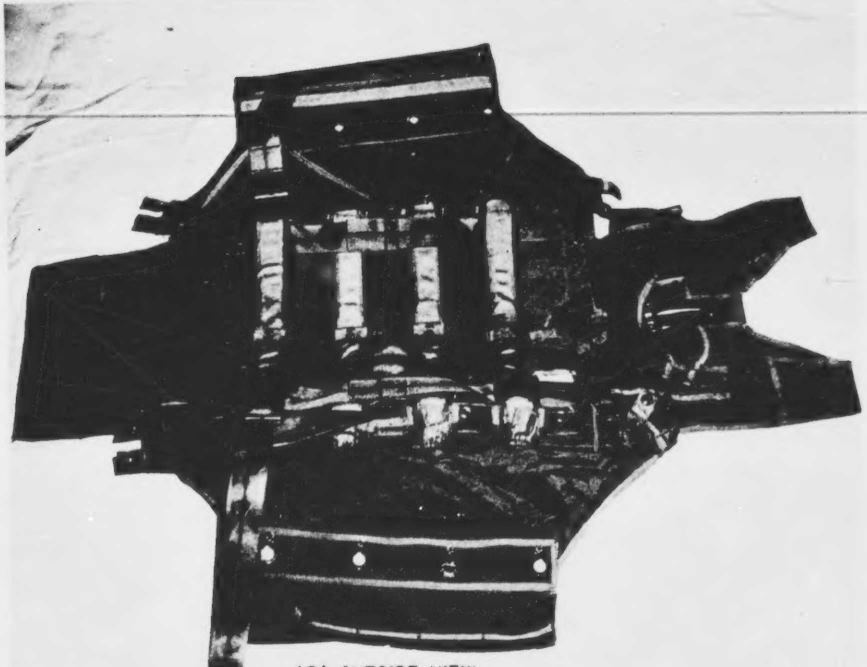

(A)
INSIDE VIEW
(B)
OUTSIDE VIEW
HANDLE
ELASTIC RIPCORD
GRIP POCKET

PR.130

Figure 3-17.—Chest type container.



(A) INSIDE VIEW

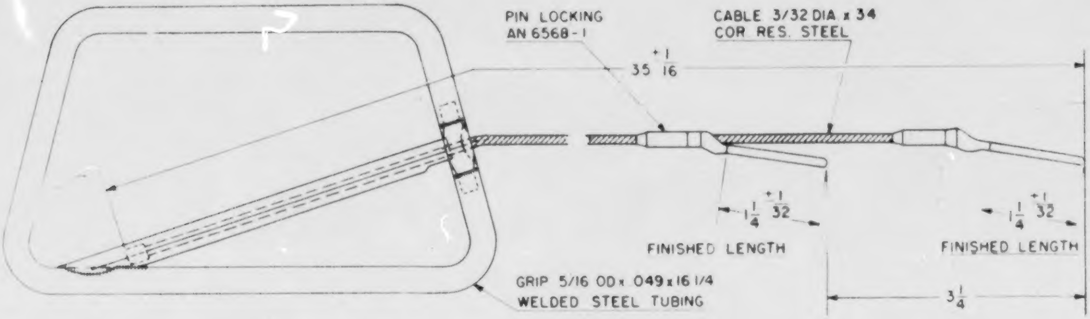


(B) OUTSIDE VIEW

PR.131

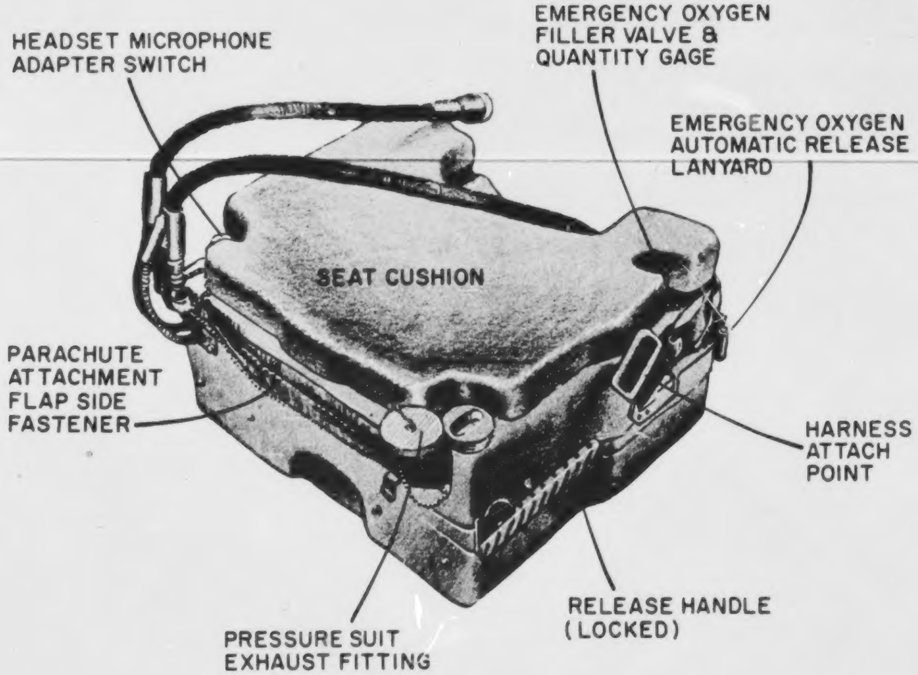
Figure 3-18.—Back type container.

BEST COPY AVAILABLE


PIN LOCKING
AN 6568-1
CABLE 3/32 DIA x 34
COR RES. STEEL
35 +1/16
1 1/4 +1/32
FINISHED LENGTH
1 1/4 +1/32
FINISHED LENGTH
GRIP 5/16 OD x .049 x 16 1/4
WELDED STEEL TUBING
3 1/4

PR.132

Figure 3-19.–Extensible ripcord.


HEADSET MICROPHONE
ADAPTER SWITCH
EMERGENCY OXYGEN
FILLER VALVE &
QUANTITY GAGE
EMERGENCY OXYGEN
AUTOMATIC RELEASE
LANYARD
SEAT CUSHION
PARACHUTE
ATTACHMENT
FLAP SIDE
FASTENER
HARNESS
ATTACH
POINT
RELEASE HANDLE
(LOCKED)
PRESSURE SUIT
EXHAUST FITTING

PR.133

Figure 3-20.–Survival kit container.

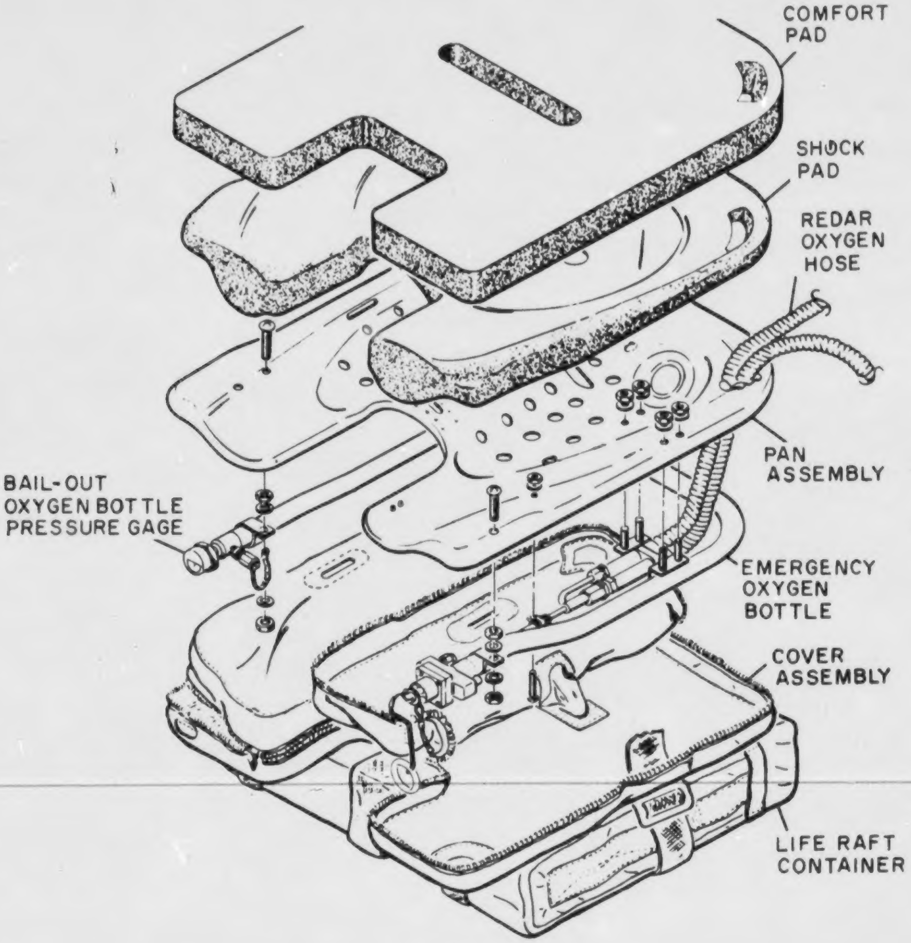

COMFORT PAD
SHOCK PAD
REDAR OXYGEN HOSE
PAN ASSEMBLY
BAIL-OUT OXYGEN BOTTLE PRESSURE GAGE
EMERGENCY OXYGEN BOTTLE
COVER ASSEMBLY
LIFE RAFT CONTAINER
PR.134

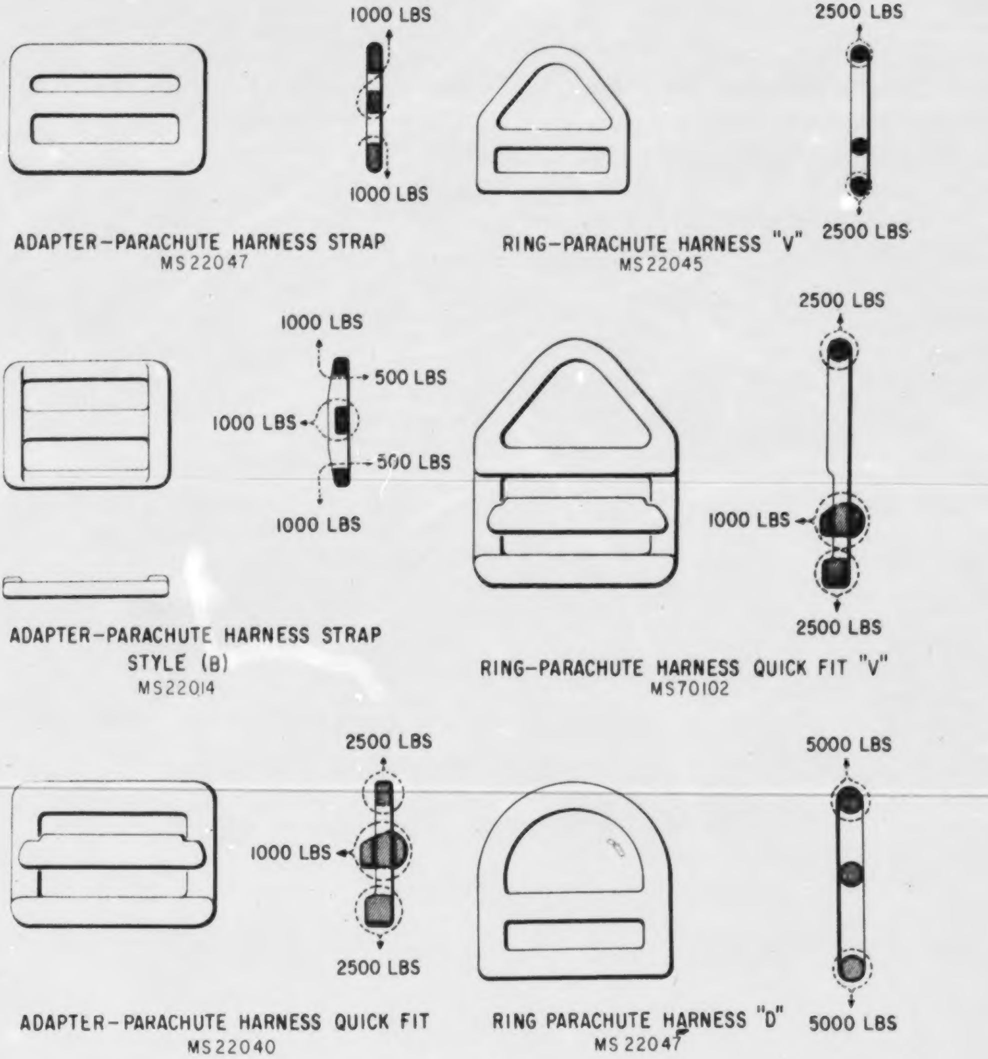
Figure 3-21.—Seat pan assembly.

the ripcord cable and prevent accidental opening of the parachute. The housing is secured to the harness and container in such a manner as to permit the parachute assembly to be improperly lifted by the housing without withdrawing the ripcord locking pins from the locking cones on the parachute container.

The ripcord grip pocket is made of type III nylon fabric conforming to Specification MIL-C-7219B, amendment 1. It is designed to retain the ripcord grip under normal circumstances and still provide ease in removal when the ripcord is properly pulled.

AUXILIARY COMPONENTS

Some of the older type parachutes still use seat cushions and back pads. These cushions and pads are made of foam rubber covered with canvas and are designed to provide comfort to the wearer when attached properly between the parachute harness and the wearer.

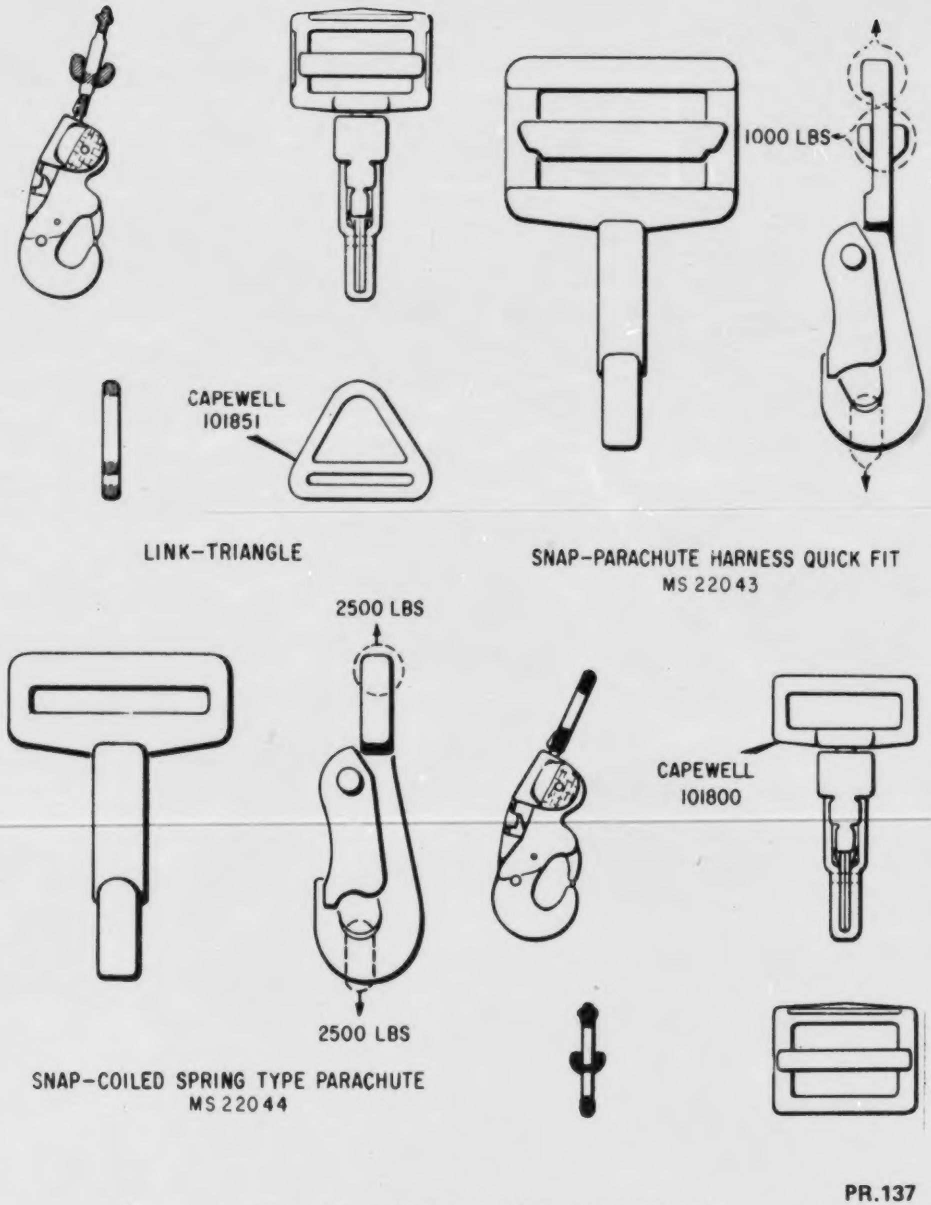

1000 LBS
1000 LBS
ADAPTER–PARACHUTE HARNESS STRAP
MS22047
2500 LBS
2500 LBS
RING–PARACHUTE HARNESS "V"
MS22045
1000 LBS
500 LBS
1000 LBS
500 LBS
1000 LBS
ADAPTER–PARACHUTE HARNESS STRAP
STYLE (B)
MS22014
2500 LBS
1000 LBS
2500 LBS
RING–PARACHUTE HARNESS QUICK FIT "V"
MS70102
2500 LBS
1000 LBS
2500 LBS
ADAPTER–PARACHUTE HARNESS QUICK FIT
MS22040
5000 LBS
5000 LBS
RING PARACHUTE HARNESS "D"
MS 22047

PR.136

Figure 3-22.—Parachute harness hardware.

As shown in figure 3-20, the seat cushion is a part of the survival kit when used with the NB-7E in the RA5C type aircraft. This cushion is made of a sponge type polyurethane pad and is bonded to the contoured surface on top of the upper half of the container. The parachute and upper half of the container are secured together by slide fastener flaps at the lower end of the parachute and the aft end of the container upper half.

The NES-12A/C and NES-16A/B parachutes, as used in the A-4 type aircraft, uses the seat pan assembly as a cushion. This assembly serves both as a cushion for the pilot and a container for the emergency bailout oxygen supply cylinder.


1000 LBS
CAPEWELL
101851
LINK-TRIANGLE
SNAP-PARACHUTE HARNESS QUICK FIT
MS 22043
2500 LBS
CAPEWELL
101800
2500 LBS
SNAP-COILED SPRING TYPE PARACHUTE
MS 22044

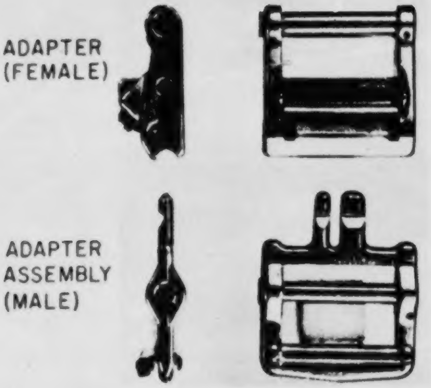
PR.137

Figure 3-23.—Parachute harness hardware—Continued.

As illustrated in figure 3-21, the seat pan consists of a metal pan, shock pad, foam comfort pad, 28-inch U-shaped oxygen cylinder, and cover which is fastened over the complete assembly by means of a slide fastener. The life raft container is attached to the bottom of the seat pan and both are fitted into the seat bucket.

HARNESS HARDWARE

Parachute harness fittings (hardware) are small metal devices usually made of cadmium or



PR.138
Figure 3-24.–Koch release adapters.

chrome-plated steel. They are designed to join the parachute and harness and to afford easy and rapid adjustment of the harness to the wearer.

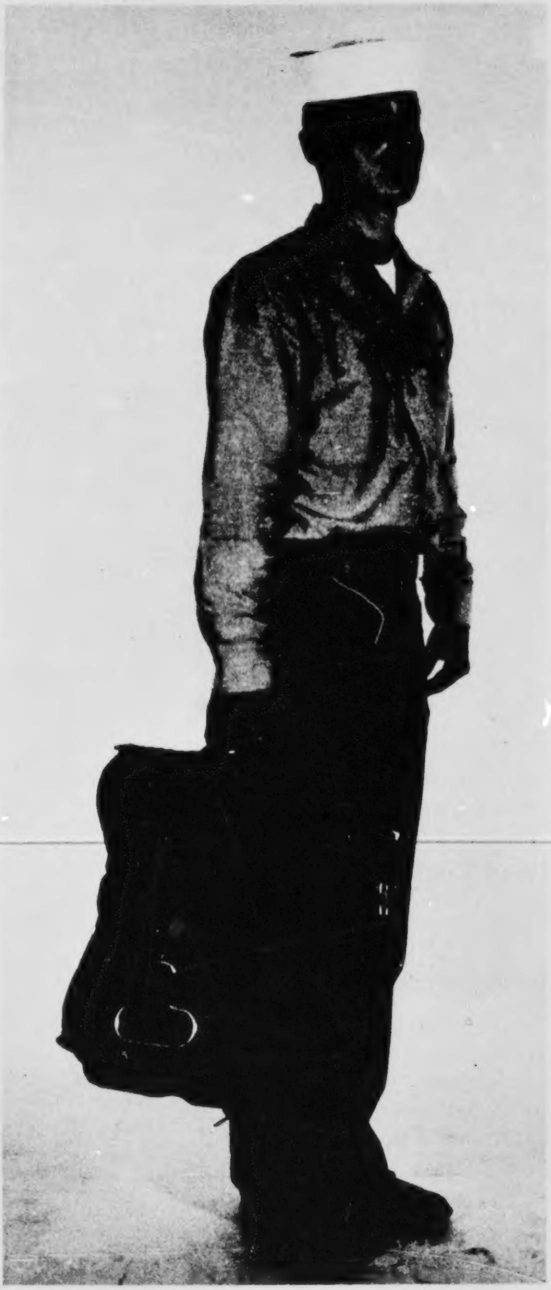
The many types of parachute harness fittings include adapters, snaps, D-rings, V-rings, connector links, and Koch release adapters. Some of the more common types of these fittings and their tensile strengths are illustrated in figures 3-22 and 3-23.

Adapters

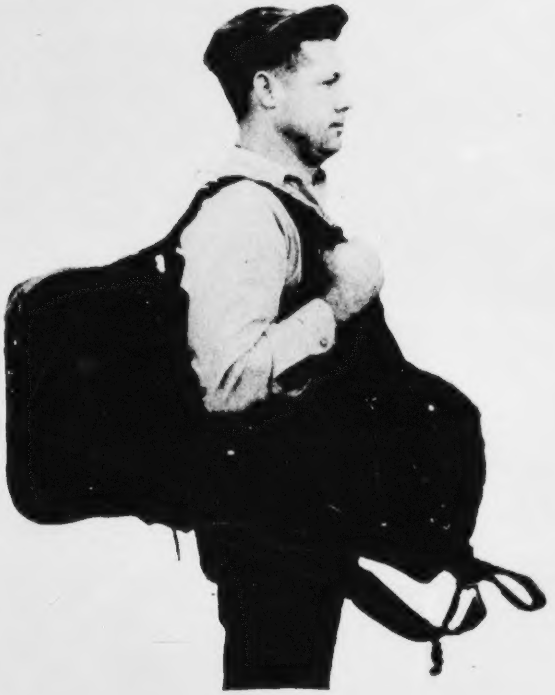
Two types of adapters are used with a regular quick-fit type harness. They are the regular harness adapter and the friction adapter. The harness adjuster adapter is used to adjust the harness to the wearer and the friction quick-fit adapter has a grip slide bar which facilitates quick adjustment of the harness by the wearer.

Snaps

There are several types of snaps in use with parachutes. They are the plain harness snap, the quick-fit snap, and the quick connector snap. The harness snap is a plain hook-shaped, spring-actuated guard, which snaps over a V-ring to secure two parts of the harness together. The quick-fit snap is similar except that it has a grip slide bar. The quick connector snap is similar to

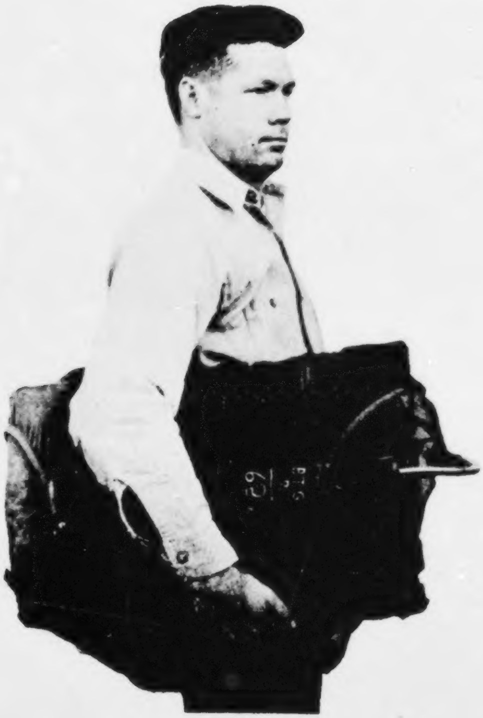


PR.149
Figure 3-25.–Method of carrying the chest type parachute with or without the liferaft container.



PR.150

Figure 3-26.—Method of carrying the seat type parachute when rigged with or without the liferaft container.



PR.151

Figure 3-27.—Method of carrying the back type parachute without the liferaft container.

the harness snap and is used as a means to quickly attach the Navy chest type parachute to the two D-rings on the Navy chest type harness.

Connector Links

Connector links are fittings designed to join the parachute to the harness. The suspension lines are attached to one side and the harness to the other.

Koch Release Adapters

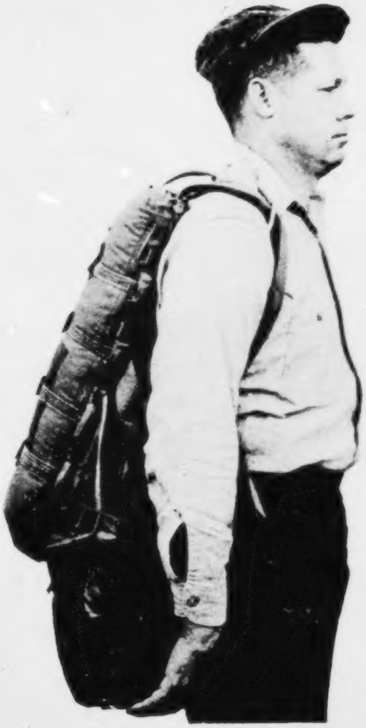
Integrated torso suit harnesses are equipped with two Koch release adapters which attach to the fittings on the lap belts of the integrated parachute assembly. In addition, two Koch release adapters are attached to each side of the upper chest of the torso harness and the riser assembly of the integrated parachute assembly. Release fitting adapters are manufactured in two parts—male and female.

The male portion of the adapter is attached to the torso suit harness, while the female portion is attached to the riser assembly of the parachute. Figure 3-24 shows the Koch parachute release adapters.

TRANSPORTING AND HANDLING

The most effective way to explain the subject of handling packed parachutes is to list a series of DO's and DONT's.

1. Do not pick up a parachute by its risers or ripcord. Lift web tackings break relatively easily and when they do, the suspension lines are almost certain to become disarranged.
2. Do not allow a parachute to come in contact with lighting fixtures or heat sources.
3. Every precaution must be taken to prevent soiling or contaminating parachute assemblies.



PR.152

Figure 3-28.—Method of carrying the back type parachute when rigged with the liferaft container.

4. Parachute assemblies should not be stacked on top of each other or on the floor, unless they are contained in suitable shipping containers.

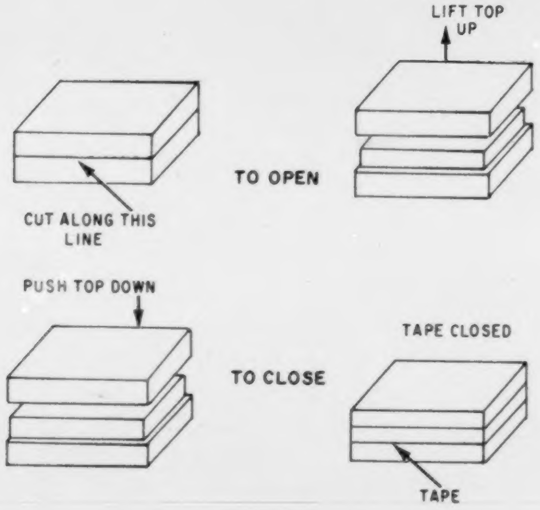
5. Do not leave a parachute where heavy objects can be dropped or placed on it. Permitting a parachute to be carried in a cargo net along with squadron cruise boxes or similar gear displays poor handling techniques.

6. Use utmost caution when handling parachute assemblies with installed cartridge activated devices.

7. Do not tack ~~or~~ tie a container with the parachute in the packed condition.

8. Vehicles used to transport parachute assemblies must be thoroughly cleaned, checked for contamination, and provided with suitable covers during inclement weather.

9. Be prepared to give brief lectures instructing personnel on how to handle parachutes.



PR.115

Figure 3-29.—Opening and closing a cardboard standard shipping container.

Figures 3-25 through 3-28 illustrate the best methods of carrying packed parachutes when rigged with and without the liferaft container.

CONTAINERS

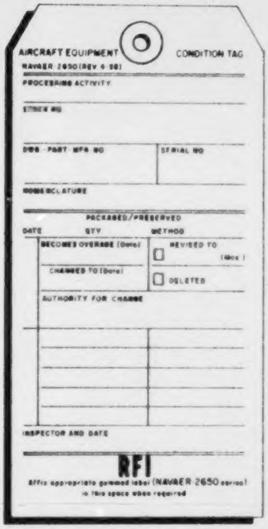
Parachutes are shipped and/or stored in sealed shipping containers, of either cardboard or metal construction and of suitable size. These containers are designed for reuse and they must be opened and closed with care. (See fig. 3-29.)

When using the container for returning parachutes to supply or transferring the assembly to another activity, insure that the old tags and labels on the container are removed or marked out. Insure that the proper tags and labels are attached and properly filled out on the transferring container. Tags and labels are shown in figure 3-30.

CARE

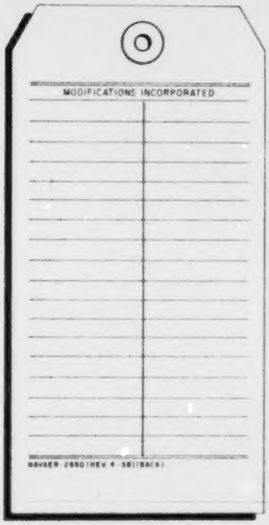
To place a parachute assembly into temporary storage proceed as follows:

NOTE: This procedure is for parachute assemblies that are in an RFI status only.



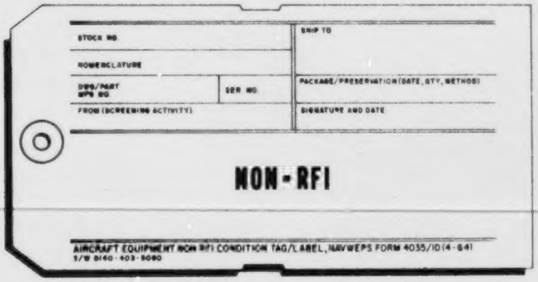
AIRCRAFT EQUIPMENT CONDITION TAG
NAVAER 2650 (REV 4-58)
PROCESSING ACTIVITY
STOCK NO
DWG · PART · MFR NO
SERIAL NO
NOMENCLATURE
PACKAGED/PRESERVED
DATE QTY METHOD
BECOMES OVERAGE (Date)
☐ REVISED TO (Mos.)
CHANGED TO (Date)
☐ DELETED
AUTHORITY FOR CHANGE
INSPECTOR AND DATE
RFI
Affix appropriate gummed label (NAVAER 2650 series) in this space when required

READY FOR ISSUE TAG (FRONT)
(COLOR MANILA)



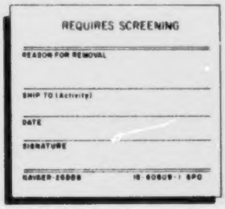
MODIFICATIONS INCORPORATED
NAVAER 2650 (REV 4-58) (BACK)

READY FOR ISSUE TAG (BACK)
(COLOR MANILA)



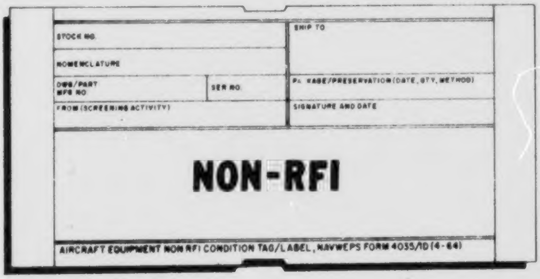
STOCK NO.
SHIP TO
NOMENCLATURE
DWG/PART MFR NO.
SER NO.
PACKAGE/PRESERVATION (DATE, QTY, METHOD)
FROM (SCREENING ACTIVITY)
SIGNATURE AND DATE
NON-RFI
AIRCRAFT EQUIPMENT NON RFI CONDITION TAG/LABEL, NAVWEPS FORM 4035/10 (4-64)
S/N 0140-403-9000

NON READY FOR ISSUE TAG
(COLOR GREEN)



REQUIRES SCREENING
REASON FOR REMOVAL
SHIP TO (Activity)
DATE
SIGNATURE
NAVAER-2650B 16-60609-1 GPO

SCREENING LABEL
(COLOR BLUE)



STOCK NO.
SHIP TO
NOMENCLATURE
DWG/PART MFR NO
SER NO.
PACKAGE/PRESERVATION (DATE, QTY, METHOD)
FROM (SCREENING ACTIVITY)
SIGNATURE AND DATE
NON-RFI
AIRCRAFT EQUIPMENT NON RFI CONDITION TAG/LABEL, NAVWEPS FORM 4035/10 (4-64)

NON READY FOR ISSUE LABEL
(COLOR WHITE)

PR.116

Figure 3-30.—Shipping tags and labels.

1. Inspect the parachute assembly, insuring that it is in an RFI status. Check the name plate information with the recorded information on the Parachute History Card. Fill out an Aircraft Equipment Condition Tag, indicating the assembly name, serial number, and part number.

2. Remove and disarm the automatic actuator.

3. Remove cartridges from all other cartridge actuated devices (i.e., cartridges from the NB-11 spreading gun). Store the cartridge in accordance with existing instructions.

4. Release all snap fasteners, open all slide fasteners, and remove one end of all the parachute container spring opening bands.

5. Chain the parachute suspension lines.

6. Remove the manual ripcord cable assembly and place it in a small paper or plastic bag.

7. Examine the shipping container for condition, remove or mark out all old tags or labels on the container.

8. Place the ripcord assembly in a side pocket of the parachute bag or bottom of the container. Spread 1/8 pound of naphthalene flakes in the bottom of the container. Place the parachute harness and/or parachute container into the shipping container. Spread 1/8 pound of naphthalene flakes on top of the parachute container. Insert the suspension lines loosely and fold in the canopy, then sprinkle 1/4 pound of naphthalene flakes into the canopy folds. Lay the pilot parachute into the shipping container uncompressed.

9. Close the shipping container, if a cardboard box is used, tape the flaps closed. (See fig. 3-29.)

10. Attach the Aircraft Equipment Condition Tag to the shipping container.

11. Indicate on the Parachute History Card the storage location, and the date placed into storage. Maintenance control of the operating custodian maintains custody of the Parachute History Card

To take a parachute assembly out of service, for turning into supply and/or depot level of maintenance for modification, rework, screening, repair, long term storage, or reissue, use the same procedures as discussed earlier in this section but with the following exceptions:

1. If screening is required, indicate that information on the NON-RFI label.

2. When inserting the parachute into the shipping container, include the Parachute History Card and all other related documents (MAF, Damage Charts, etc.). Attach to the shipping container to the applicable tag.

CHAPTER 4

WORK CENTER ARRANGEMENT

The Aviators Equipment Work Center (Parachute Loft) is the work area designated for the inspection, maintenance, repair, and packing of parachute assemblies, systems, and components. It should be centrally located and at ground level for easy access to all activities being serviced. The design and style of parachute lofts ashore and afloat will vary in size and maintenance capabilities, depending upon the space available, loft equipment, and the activity's basic mission.

WORK CENTER

The three general types of parachute lofts currently in use are the shore-base parachute loft, the shipboard parachute loft, and the portable advanced-base parachute loft. Parachute lofts should be of sufficient size to accommodate parachute packing tables 36 inches high, at least 36 inches wide, and long enough to accept for servicing the longest parachute presently in service use.

Other considerations related to parachute lofts are rooms for additional shops such as the oxygen section, CO_2 section, and the inflatable survival equipment section.

Proper utilization of the limited working space allotted to the parachute loft is a primary concern and responsibility of the branch supervisor. In order to accomplish the vast amount of work that flows through the parachute loft, everyone concerned must cooperate by adhering to a well-planned work schedule. All parachute lofts must be manned by qualified Aircrew Survival Equipmentmen.

Figure 4-1 shows a typical parachute loft ashore.

Figure 4-2 shows a typical parachute loft aboard ship.

ENVIRONMENTAL REQUIREMENTS

Regulated temperature and humidity conditions must be maintained in the parachute packing section, storage facilities, and dry locker wherever possible; advanced-base and temporary facilities are the exceptions. The temperature and humidity in the parachute loft must be maintained within specified limits; ideal conditions in the packing loft and dry locker are a temperature of 75°F and a relative humidity of 60 percent. The work center must be kept free of dust and dampness and be well ventilated. Figure 4-3 illustrates the temperature-humidity chart; the shaded area outlines the allowable environmental limits.

These limits are affected by two variables; temperature and relative humidity. Recordings of these variables must be taken three times daily, to insure that favorable conditions are maintained; use the relative humidity and temperature indicator shown in figure 4-4.

The ideal method for regulating air temperature and humidity is an air conditioning system. To insure maximum effectiveness from the air conditioning unit, continuous checks must be made of the physical conditions of the parachute loft.

Lighting

Lighting the parachute loft is very important. It takes good eyes and good lighting to find stitching irregularities and ruptures in glossy white material. Fluorescent lighting has been found to be best, as it gives a flat light bright enough for inspecting, packing, and sewing machine work. However, parachutes should not be exposed to fluorescent lights closer than 5 feet for long periods of time.

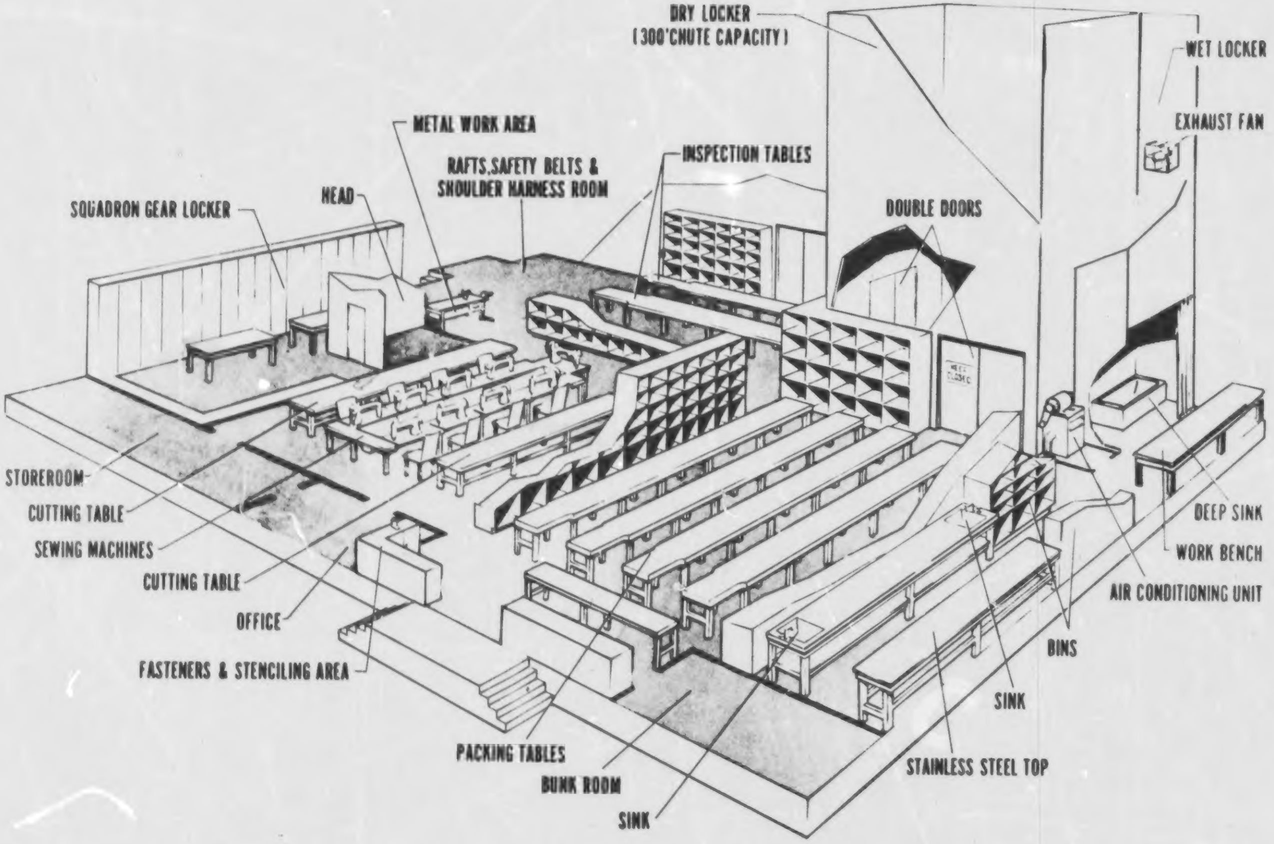
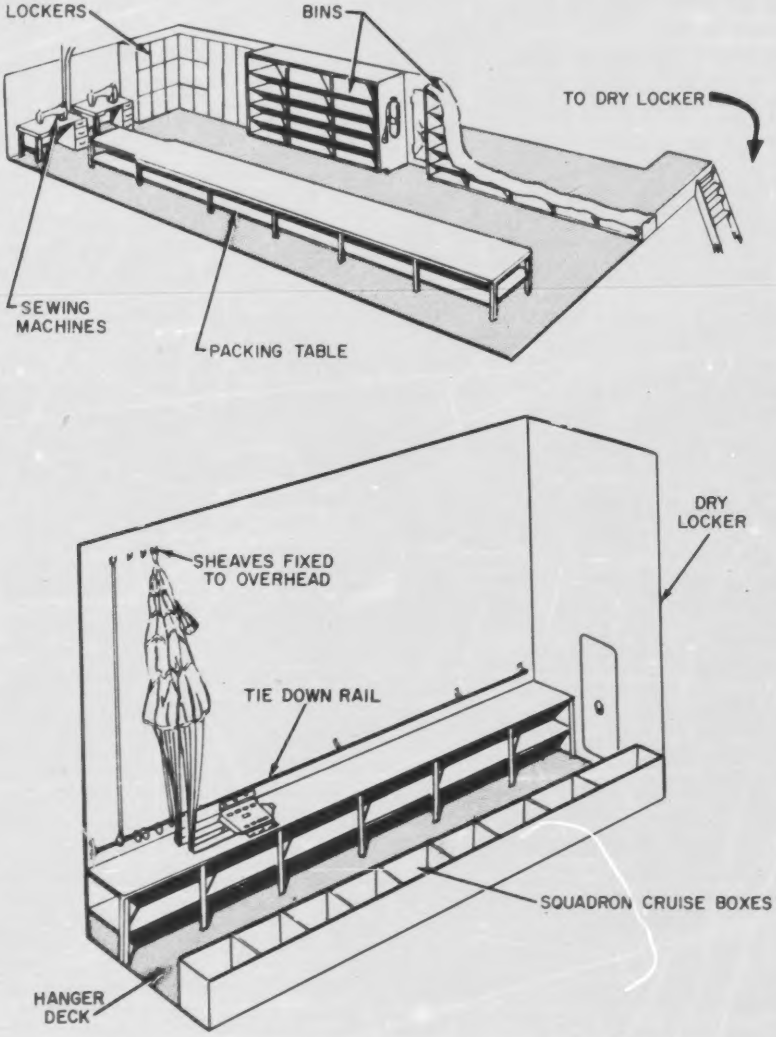
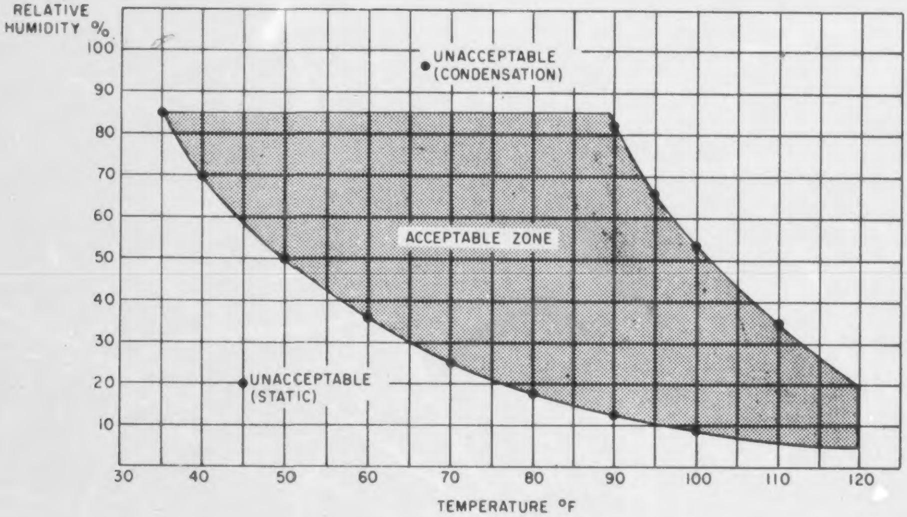

DRY LOCKER (300'CHUTE CAPACITY)
WET LOCKER
EXHAUST FAN
METAL WORK AREA
RAFTS,SAFETY BELTS & SHOULDER HARNESS ROOM
INSPECTION TABLES
SQUADRON GEAR LOCKER
HEAD
DOUBLE DOORS
STOREROOM
CUTTING TABLE
SEWING MACHINES
CUTTING TABLE
OFFICE
FASTENERS & STENCILING AREA
PACKING TABLES
BUNK ROOM
SINK
STAINLESS STEEL TOP
SINK
BINS
AIR CONDITIONING UNIT
WORK BENCH
DEEP SINK
PR.140

Figure 4-1.—Typical parachute loft (ashore).


LOCKERS
BINS
TO DRY LOCKER
SEWING MACHINES
PACKING TABLE
SHEAVES FIXED TO OVERHEAD
DRY LOCKER
TIE DOWN RAIL
SQUADRON CRUISE BOXES
HANGER DECK

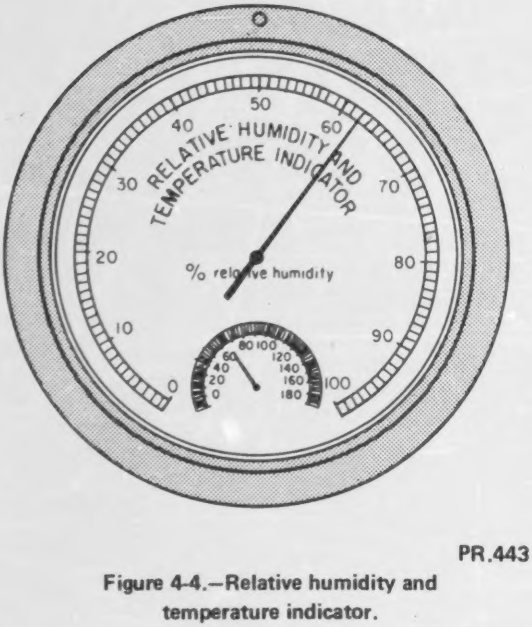
PR.105

Figure 4-2.—Typical parachute loft (aboard ship).



PR.422

Figure 4-3.–Temperature-humidity chart.


RELATIVE HUMIDITY AND TEMPERATURE INDICATOR
% relative humidity
0
10
20
30
40
50
60
70
80
90
100
0
20
40
60
80
100
120
140
160
180

PR.443

Figure 4-4.–Relative humidity and temperature indicator.

Parachute inspection tables have glass tops and are illuminated by fluorescent lighting from beneath the table top. The inspection table should be long enough to inspect an entire gore at one time, be smooth and free of slivers and burrs, and radiate minimum heat from the lighting source.

Do not leave parachutes on lighted tables longer than required for an inspection. Excessive exposure to artificial lighting is harmful to nylon parachute materials.

DESIGN CRITERIA

A basic consideration in the work center layout is the purpose of the work center. The general function of the work center must be considered in the allocation of space and equipment. The ideal setup contains enough space to have the raft shop, sewing room, dry locker, packing section, and oxygen shops in separate spaces in a centrally located area. Since this is not normally possible, some shops must be combined and the decision is based on factors of safety, economy, functional compatibility, and convenience.

The wet locker and washroom should be separated. The packing area, dry locker, storerooms, and fabric area should be separated if space is available. Packing tables should be adequately spaced, in close proximity to the dry locker, and so positioned as to be free of obstacles when manually transporting parachutes from the dry locker to the packing table.

The following sections will contain information on the various work areas.

PARACHUTE PACKING SECTION

The parachute packing section is devoted to packing and inspection of parachutes. Parachute packing tables naturally occupy the greatest area of the loft. Thorough consideration should be given to the number of tables that can be successfully utilized, allowing ample working space around the tables. Packing tables must be of sufficient length to allow laying out the complete parachute assembly for inspection and packing. The recommended dimensions are 45 feet by 36 inches by 36 inches.

A cutaway packing table is the least tiring to use, as the packers do not have to stretch across its full width during the closing and finishing of the packing.

DRY LOCKER

The dry locker, or drying tower as it is sometimes called, is used to condition parachutes which are subjected to excessive moisture. The dry locker must contain controlled environmental conditions. The height of the dry locker should be sufficient to permit the parachute to hang full length without touching the walls, the deck, or other parachutes. To suspend freely, a 28-foot parachute requires a height of approximately 45 feet, and for adequate drying, the hoisting lines should be a minimum of 2 feet apart, and at least 12 inches from the bulkhead.

For adequate lighting, the flush type, low heat, incandescent light fixtures are recommended; the dry locker should be devoid of windows or skylights.

A dry locker is shown in figure 4-1, which illustrates one of the many possible floor plans of a typical parachute loft.

WET LOCKER

The wet locker is used for drying parachutes after washing. It must be a separate compartment from the dry locker, and must be provided with dehumidification and deck water drains. Other construction features of the wet locker are similar to those of the dry locker requirements.

WASHROOM

The washroom is used for washing parachutes. It should contain a large tub or vat of sufficient size to allow complete submersion of the parachute assembly. Hoist lines should be provided over the tub to simplify handling of the parachute.

STORAGE AREA

Bins, shelves, and cupboards must be provided in the parachute loft to accommodate packed or unpacked parachutes and various other components. The shelving should be designed to facilitate storage of parachutes at least 4 inches from the walls and 12 inches from the deck. The storage area must be well ventilated and free of dust and other contaminates.

SEWING SECTION

The sewing section of the parachute loft must be equipped with sewing machines, cutting tables, fabric racks, and a suitable locker facility.

The cutting table should be from 30 to 33 inches high, so that the PR may comfortably perform any cutting operation. The table should be at least 54 inches wide to handle the most frequently used widths of materials. The table length will depend upon the available area and workloads.

The fabric rack should be located adjacent to the cutting table, as it is used for the purpose of stowing fabric materials in the sewing section. A fabric rack should be designed and constructed of considerable strength in order to accommodate large heavy rolls of material. The rack may or may not be portable.

Lockers should be located in the vicinity of the fabric section. Small items, such as measuring instruments and cutting, stapling, and setting tools, should be safely stowed in lockers. Needles and spare sewing machine parts should be stowed in a manner to keep dust from them. The number and location of lockers required to satisfactorily stow all necessary items can be determined by the available space in the parachute loft.

INFLATABLES SECTION

The inflatable section provides for the maintenance of inflatable survival equipment, such as life preservers and liferafts. This shop area should be isolated sufficiently to prevent talcum powder dust from contaminating the air in the oxygen shop and other work center spaces; dustproof doors are recommended.

A partial list of the shop equipment that must be provided is as follows:

1. Workbenches, storage shelves, and equipment cabinets.
2. Washing and cleaning spaces for hosing down inflated liferafts, and washtubs for cleaning life preservers. This area should be closed to prevent excessive moisture from entering the inspection, repair, and storage areas.
3. A smooth surface floor for handling inflated liferafts.
4. A source of compressed air for inflating survival equipment that is to be leak tested.
5. A rotary vacuum pump for deflating the survival equipment.
6. A method of controlling temperature and humidity, similar to that of the parachute loft.

CO_2 TRANSFER SECTION

The CO_2 transfer section is a space provided for weighing and recharging carbon dioxide cylinders used in the inflation of liferafts. It is advisable to separate the carbon dioxide recharge equipment from the oxygen section of the shop, either by partitioning the space or grouping of the CO_2 material in a separate section.

The space must be well ventilated since carbon dioxide is heavier than air and tends to collect in low areas; in addition, CO_2 is both invisible and practically odorless.

Shop equipment includes a recharge or transfer unit, supply cylinder, tilt rack, weight scales, and the necessary high-pressure hoses, control valves, adapters, etc.

OXYGEN SECTION

The oxygen shop is devoted to testing and maintaining oxygen regulators, liquid oxygen converters, automatic parachute actuators for correct altitude firing, testing aviators breathing oxygen, and other airborne equipage.

This space must be in a dirt- and dust-free area, and have provisions for the control of temperature and humidity.

A well-equipped oxygen shop is generally provided with the following basic equipment:

1. Oxygen regulator test stands.
2. Liquid oxygen converter test stands and associated equipment.
3. Vacuum pump.
4. Workbenches, storage shelves, and equipment cabinets.
5. Machinist's vise, special tools, and necessary handtools.
6. Water vapor indicators, halide detectors, and purity analyzers used in testing aviator's breathing oxygen for contamination.

SAFETY

The safety precautions contained in this chapter are applicable to all personnel. They are of necessity basic and general in nature and are not inclusive of all conceivable operations and functions involved in the great variety of the PR's activities. The continuous cooperation and vigilance of all personnel is needed to see that all operating procedures and work methods do not unnecessarily expose personnel to injury or property to loss or damage.

Posting of Safety Precautions is the displaying of any plate, placard, painted sign, or written material in a conspicuous place. Safety Precautions must be placed on or near any equipment, component or material which presents a hazard to the security of the activity or to the safety of personnel.

WORK CENTER

It is the responsibility of supervisory personnel to insure that their subordinates are instructed in and carry out the applicable safety precautions for their work and work areas.

Each individual is responsible for knowing, understanding and observing all safety precautions applicable to his work and work area. In addition, he is responsible for the following:

1. Each individual must report for work rested and emotionally prepared for the tasks at hand.
2. He must use normal prudence in all his functions, commensurate with the work at hand.
3. He must report any unsafe condition, or any equipment or material which he considers to be unsafe, and any unusual or developing hazards.
4. He must report to his supervisor any accident, injury, or evidence of impaired health occurring in the course of work.
5. He must wear or use the protective clothing and/or equipment of the type required, approved and supplied for the safe performance of his work.
6. He must warn others whom he believes to be endangered by known hazards or by failure to observe safety precautions, and of any unusual or developing hazards.

As you complete your check-in sheet in a newly assigned activity and meet your new Shop/Work Center supervisor, perhaps the single most important thing you can do is ask questions–lots of them. There is no "stupid question," and while you are getting yourself adjusted to your new duties, the answers to these questions may save you from serious injuries. A separate safety indoctrination lesson which covers all the major hazards of the work center should be given the new man as soon as he reports for work. No supervisor with an effective safety program and an excellent work center safety record wants to take the chance that the new man will be injured before attending the complete series of safety lessons.

A partial list of the work center safety precautions to be observed follows:

1. Observe "no smoking" areas.
2. Make certain that all electrical equipment is grounded and that you are not.
3. Know the different classes of fire and how to extinguish them.
4. Use only approved trash cans with self-closing hinged covers as receptacles for such materials as oily or soiled rags.
5. Use the right tool for the job. Do not use make-shift handtools.
6. Return and properly stow tools when you have finished with them. Do not carry tools in your pockets.
7. Compressed air is dangerous. Never direct a stream of compressed air at anyone.
8. All solvents will cause skin irritation or burns if prolonged contact occurs. Wear appropriate clothing and wash immediately after contact.
9. All solvents are toxic. Never use them in a space without adequate ventilation.
10. Heads up when you are using a "spray can" of any kind. Aerosol containers can bite back.
11. Never attempt to operate a piece of machinery or equipment unless you are fully qualified.
12. Observe all danger signs, and do not remove them without proper authority.
13. Observe special safety precautions relating to automatic actuators and spreading guns as printed on the shop process cards.
14. Flammable materials must be kept in designated spaces.

The PR who wishes to contribute to safety improvement must know his job and must develop professional pride in the quality of his work.

SEWING MACHINE OPERATION

Before making any adjustments that may require contact with moving parts of the sewing machine, you must cut off the motor or disconnect the drive belt.

Other safety precautions that must be observed are as follows:

1. Protect the face from the thread take-up lever when operating the sewing machine.
2. Turn on the motor only when ready for operation.
3. Keep fingers clear of the needle during operation.
4. Gage (guide) work by the presser foot. Do not follow the needle with the eyes.
5. Turn electrical power off before leaving the sewing machine.
6. Remove the drive belt when installing a needle or bobbin.

7. Be sure that the balance wheel always turns over toward the operator of the machine. Never turn the balance wheel more than a half turn backward.

8. Do not operate a machine without material beneath the presser foot. If it is necessary to test run a machine, remove needles, bobbins, and presser foot, or place a scrap of material beneath the presser foot. Keep the bed slide plates closed while the machine is in operation.

9. Make certain that the machine is properly grounded.

10. Adequate lighting must be maintained at all times in the sewing section. Good lighting not only decreases the hazard of accidents but also enhances the operator's health and comfort. It also minimizes sight weakness and conserves manpower.

11. Use extreme caution in handling and using such potentially dangerous equipment as awls, shears, and scissors. Do not carry such equipment in your pockets; avoid jostling.

These above listed items of information are by no means a complete list. They are, however, a comprehensive group of statements from which you may begin your own personal safety program. Safety is your job–any suggestions you have to improve conditions will be acted on immediately–turn in your ideas to your supervisor or safety petty officer.

FLIGHT LINES AND DECKS

Normally PR's are not required to perform maintenance tasks outside of their work centers. However, PR's assigned to organizational maintenance level activities do conduct 7/14 day inspections on in-service parachute assemblies installed in aircraft.

In addition to the more specific safety precautions presented in various other chapters and in other sections of this chapter, there are a number of miscellaneous precautions which must be observed when working on the aircraft flight line ashore and the ship's flight deck.

The following are especially important.

Flight Line

1. Only qualified and licensed drivers may operate tractors, mules, or other motor vehicles.

2. Do not use make-shift equipment as a work stand. Keep all hand and guard rails installed.

3. Never walk backwards in the vicinity of aircraft which are turning up.

4. Protect your feet with steel-toed safety shoes.

5. Do not use aircraft ladders unless they are in good condition and properly secured.

6. Beware of propellers. When you see a propeller, let it be a constant reminder to "Stay Clear!" In general, do not cross in front of moving propellers, as whirling propellers are not easily seen.

7. No smoking signs must be observed.

8. Stand clear of aircraft intake ducts.

9. Stand clear of aircraft exhaust areas.

10. Wear the proper ear protection (ear-plugs and/or sound attenuators).

11. Observe aircraft movable surface hazards.

12. Observe safety precautions relating to ejection seat mechanisms. The following ejection seat general precautions should always be kept in mind:

a. Ejection seats must be treated with the same respect as a loaded gun.

b. Always consider an ejection seat system loaded and armed.

c. Before entering a cockpit know where the ejection seat safety pins are located and be certain of their installation.

d. Only qualified personnel may work on or around ejection seats and components.

13. Stand clear of the tailhook area. The tailhook can be dropped by mistake any time and they drop with enough force to cause severe injury.

The above list of safety precautions is not intended to be complete as each activity may have safety precautions unique to that activity due to special circumstances and operational requirements. Petty officers are charged with the responsibility of knowing and enforcing those that apply to their area of work and their men.

Flight Decks

Much of the work done aboard ship will have to be done under less than ideal conditions. Confined spaces, reduced lighting during nighttime flight operations, hazardous conditions on the flight and hangar decks, and a variety of conditions peculiar to ship operations will require modifications of procedures used ashore.

The previously discussed flight line safety precautions are applicable to flight deck operations.

The predeployment training lectures for personnel should include flight and hangar deck safety precautions. This training requirement is in addition to the general indoctrination given all personnel concerning flight quarters, general quarters, abandon ship, man overboard, and other general drills; ship conditions, smoking, and safety precautions; and watch standing requirements peculiar to shipboard operations.

In addition to the safety precautions that apply to flight line operations, some of the general precautions which should be observed while working on the flight deck are listed below:

1. Learn two ways to go from your shop to a weather deck or source of fresh air. Be able to do this blindfolded.
2. Learn two ways to go from your bunk to a weather deck or source of fresh air. Be able to do this blindfolded.
3. Over 65 percent of all carrier injuries occur on the flight deck. Never go on the flight deck unless your job specifically requires that you do so.
4. In a 7-months cruise, an average of eight men will fall or be blown from a carrier into the water. Never go to the flight deck when air operations are in progress unless you wear a complete flight deck uniform.
5. Your complete flight deck uniform will normally include:
    a. Cranial impact helmet or its equivalent.
    b. Flotation equipment.
    c. Goggles
    d. Colored jersey with long sleeves.
    e. Hard toe safety shoes.
    f. Sound attenuators.
    g. An adequately secured whistle and survival light.
6. Never turn your back on an aircraft taxiing on the flight deck.
7. Know where your GQ (General Quarters) station is and what your duties are. Always conform to the shipboard traffic flow, and proceed to your station during drills at a "trot." Do not run.
8. Do not stand in or otherwise block entrances to the island structure or exits leading off the catwalks.
9. "Wear your head on a swivel" and stay alive. As stated earlier, the above list of safety precautions are not complete, they are general and intended to be readable and effective.

OXYGEN/CO$_2$ TRANSFER

Although most of the oxygen equipment and related components are operated by PR's in the higher pay grades, lower rated PR's must be familiar with the hazards involved in working with oxygen and carbon dioxide transfer equipment. All PR' are charged with the knowledge of the following safety precautions:

1. Keep oil and grease away from oxygen and oxygen equipment, this is the primary rule to remember.
2. When attaching an oxygen transfer line, always make certain the connections are clean, dry, and in good condition.
3. Handle cylinders carefully and never drop or bump them.
4. Never mix oxygen with other gases.
5. Never use anything but an approved cleaning agent for cleaning oxygen parts and fittings.
6. Protect cylinders from excessive temperatures. (Maximum temperature 130°F.)
7. Tag or mark empty cylinders.
8. Always replace protective valve caps on cylinders when they are not in use.
9. Never fill a lower pressure capacity cylinder without an approved pressure reducing valve.
10. Never use any piece of oxygen equipment before understanding its purpose and use.

Compressed oxygen and any flammable substance can unite with explosive results, the extent of this danger depending upon the conditions of concentration, pressure, temperature, and confinement. The main ingredient for spontaneous combustion lies in the attainment of a burning temperature. (The temperature at which a material will burn.) Applied concentrations of pure oxygen in an enclosed area where flammable material is present will result in an explosion. Danger exists in the accumulation of heat when the heat of a rapidly oxidizing hydrocarbon is unable to be carried off normally. This condition generates an excessive amount of heat which is capable of causing flammable materials to burst into flame with great force and heat, depending on the kind of material affected and its area of confinement.

Oxygen, while not flammable in itself, is the principal supporter of combustion; and since concentrated or pure oxygen greatly intensifies burning or the oxidation of any hydrocarbon, it is easy to understand the seriousness of the situation when the oxygen pressure is increased.

There are a number of additional safety precautions to be observed when handling liquid oxygen. Some of these parallel the safety precaution outlined for the handling of gaseous oxygen; however, they are worth repeating to insure against accidents. Any possible danger that may occur is based on the following general characteristics of liquid oxygen. First, the rate of combustion of most materials is greatly increased by liquid oxygen; second, contact with liquid oxygen can cause severe frostbite and damage to equipment vulnerable to freezing conditions; and third, liquid oxygen, if confined, will eventually evaporate and build up a tremendous pressure which could result in the rupture of the vessel in which it is stored. Because of these and other possibilities, the following safety precautions must be observed:

1. Do not operate liquid oxygen equipment unless you are qualified or are working under the supervision of qualified personnel.
2. Wear goggles or a face shield when handling liquid oxygen.
3. Do not handle with bare hands any tubing or fitting through which liquid oxygen is flowing. Wear clean, dry gloves when handling parts of equipment cooled by liquid oxygen. (Temperature of liquid oxygen is -297°F.)
4. Do not permit smoking, open flames, or sparks in the liquid oxygen handling areas.
5. Keep work area and equipment free from oil, grease, or any other combustible material.
6. Avoid spilling liquid oxygen on floor or deck areas. In case of accidental spillage, thoroughly ventilate the area.
7. Always call oxygen by its proper name. Do not confuse it with compressed air. Never use oxygen in place of compressed air for any purpose.
8. Do not leave liquid oxygen in a closed container or trapped in a line between two valves; always open a valve on one end to avoid excessive pressure buildup.
9. Use only standard approved equipment in the handling and storage of liquid oxygen.

Carbon Dioxide

Carbon dioxide is a dangerous asphyxiant because it is not detectable by odor or color when present in hazardous quantities.

It is heavier than air and gives little if any warning to personnel exposed to it until they are completely overcome. The inhalation of carbon dioxide will produce various effects, depending on the length of time it is inhaled.

The treatment of exposed personnel consists of artificial resuscitation, administering oxygen, and keeping the patient warm and quiet.

Do not enter an area or compartment containing hazardous amounts of carbon dioxide without being equipped with a breathing mask and an independent supply of oxygen or a supplied-air respirator. If this is not practicable and the case is extremely urgent, enter only when equipped with lifelines and with assistants standing by outside the area or compartment. Stay time in the contaminated area should be restricted to a minimum.

In addition to those safety precautions relating to the CO_2 transfer pump that will be promulgated by the work center supervisor, the following is a list of general safety precautions that may prevent accidents which result from misapplication and mishandling of carbon dioxide.

1. Do not introduce any oil or grease into any of the adapters of hose connections used to convey carbon dioxide.
2. Do not close the cylinder valve or the shutoff valve while the transfer unit is pumping.
3. Disconnect the hose from the cylinder being recharged very slowly so as to allow the pressure trapped between the shutoff valve and the cylinder being recharged to escape.
4. Prior to bleeding off excess carbon dioxide, insure the inflation assembly CO_2 cylinder is clamped securely to the scale weighing pan.
5. When performing inspections of the raft inflation assembly (charged), remove the inflation assembly from the raft and not the valve from the cylinder.

6. In the event that the cylinder valve outlets become clogged with ice and it becomes necessary to thaw them out, use warm, not boiling water. Boiling water may melt the fusible plugs.

7. The transfer unit is to be used for carbon dioxide only; do not use for oxygen or other gases.

8. Do not tamper with the safety devices on the valves or cylinders.

Due allowance should be made for the hazards which may be peculiar or incident to local conditions for the handling, stowage, and use of carbon dioxide.

FLAMMABLE AND TOXIC SUBSTANCES

Good housekeeping in the work center and other aircraft maintenance areas is essential to personnel safety. The highest standards of cleanliness and order should be observed; after any maintenance task has been completed, the area must be policed and placed in a clean orderly condition. Decks and workbenches should be kept free from oil, grease, and debris. Materials, tools, and equipment must be properly stored. Air hoses, power cords, and similar equipment that are not in use must be straightened, coiled, and properly stored.

Highly flammable materials such as soiled and oily rags, must be kept in self-closing metal containers, and their contents disposed of at the end of the work day. Flammable liquids must not be poured into sewers or deck drains or on the ground. They must be collected in steel drums, cans, or other designated receptacles and disposed of as prescribed by the local command.

The variety of solvents used in compounds or formulations such as paints, adhesives, rubber materials, and other solutions pose a problem with respect to the possible hazards attendant to their use. Under certain conditions all organic solvents are toxic in varying degrees and, with few exceptions, they are flammable.

Depending upon the extent and conditions of their use in any particular operation, either independently or as principal ingredients in various mixtures, appropriate measures should be taken to minimize their toxic and flammable effects. Exposure of the skin to solvents can cause dermatitis and personnel involved in operations requiring frequent or prolonged contact with solvents should wear solvent resistant gloves.

Toluene, classified as an aromatic hydrocarbon, is an organic solvent used by the PR when recementing or replacing seam tapes on liferafts. When using this highly volatile substance the following warning always applies:

Do not use near open flame, heat or electrical sparks. Avoid prolonged contact with the skin or breathing fumes. Use only in well ventilated area.

Toluene is classed as a flammable liquid and its vapors are considered toxic. Any operation involving this solvent should be analyzed for possible health and fire hazards. Many types of paints, enamels, lacquers, and adhesives are likely to contain toluene as a thinner.

ADMINISTRATION

In order that all commands and offices concerned with naval aviation be kept fully informed of the operational and maintenance experiences of naval aviation operating activities, a large variety of records must be maintained and many reports made. Some of the reports provide purely historical information, some furnish statistical data for analyzing efficiency and economy of maintenance and operation, and others have a bearing on the supply support furnished the activity and work center. These records and reports are not limited to aircraft. Support equipment, manhours, and personnel training are representative of other areas of recordkeeping and reporting.

Through analyses of the data provided, the commands and offices, for whose use the records and reports are submitted, are enabled to better control overall operations. Standardization of maintenance and material areas is improved, unsafe or uneconomical trends are spotted and corrected earlier, and, through feedback information, the service experience of other similar activities is made available to all who would find it helpful.

For each record that has to be kept and for every report that has to be made, a governing instruction has been issued. These instructions usually give detailed instructions for the preparation of the record or report, prescribe the form and frequency of submission, and indicate the office to which they are to be forwarded. For purely local records such as training records, local instructions are provided to guide the recordkeeping.

PUBLICATIONS

The primary purpose of technical publications is to aid the technician in accomplishing his work. They are designed for him and communicate information and directions to him in his own specific technical language. They are prepared by the manufacturer of specific equipment and by the Naval Air Systems Command or its field activities in accordance with specifications issued by NavAirSysCom. They set forth current, authoritative information concerned with material upkeep, check, test, repair, and operation in a manner to provide for optimum product performance. It is extremely important, and therefore mandatory, that all personnel responsible for the operation and maintenance of aircrew survival equipment be thoroughly familiar with and use these publications and the information contained therein in the daily execution of their technical tasks.

Aeronautic publications may be grouped into two major classes or groups–those issued in the form of MANUALS, and those issued in the form of LETTER MATERIAL.

When a new aircraft, engine, accessory, or other item of equipment is accepted by the Navy, manuals necessary to insure its proper operation and upkeep are prepared and issued to all activities using and/or maintaining the equipment. Supplemental information and other directive type publications that must be issued from time to time are issued in the form of letter material. Both manual and letter publications may, on occasion, be properly referred to as directives. Broadly speaking, any communication which initiates or governs action, conduct, or procedures is a directive.

All aeronautic publications, both manual and letter type, are assigned a title and code number. When they are available for issue, all publications, except Instructions and Notices, are listed in the Naval Aeronautic Publications Index.

Naval Aeronautic Publications Index

A complete Naval Aeronautic Publications Index consists of several individual publications, each of which serves a specific purpose. They are identified as follows:

Navy Stock List of Forms and Publications, NavSup Publications 2002, Section VIII, Parts C and D (commonly referred to as the Numerical Index or List).

Equipment Applicability List, NavAir 00-500A.

Aircraft Application List, NavAir 00-500B.

Directives Application List, NavAir 00-500C.

Equipment and Subject Applicability List, NavAir 00-500D.

Numerical Index

NavSup Publication 2002 is a 13-section index of all the forms and publications used throughout the Navy and stocked by the Naval Supply Systems Command. Section VIII of this stock list is the basic index of the Naval Air Systems Command publications and contains a numerical listing of all aeronautic publications by code number, title, security classification, and the date of the latest issue. A general alphabetical index is provided in the back of the book. Also provided in the manuals part of the book is an Air Force-Navy cross-reference index.

The Numerical Index of aeronautic publications is made up of Parts C and D of Section VIII of NavSup 2002. Part C contains manual type publications and Part D contains letter type publications.

Publications in Part C (manual publications) are listed in numerical order. For example, all manuals in the 00 series are listed first, then followed by the 01, 02, 03, etc., through the 51 series. A listing of the general subject groups is shown in table 4-1.

Figure 4-5 illustrates how the publications are listed in NavSup Publication 2002, Section VIII, Part C.

Note the seven columns in the illustration. The first three columns are self explained. The following is an explanation of the last four columns:

R/D–Revision date of publication.

PS–Physical Security (Publication Security Classification).

RR–Requisition restriction code.

B/C–Indicates whether the item is a Basic Issue or Change, for issue purposes.

Table 4-1.–General subject classification numbers for manual type publications.

General	00
Aircraft	01
Powerplants (02A Reciprocating engines, 02B Jet engines, 02F Rocket engines)	02
Accessories	03
Hardware and Rubber Material	04
Instruments	05
Fuels, Lubricants, and Gases	06
Dopes and Paints	07
Electronics	08 & 16
Instructional Equipment and Training Aids	09&28
Photography	10
Aviation Armament	11
Fuel and Oil Handling Equipment	12
Parachute and Personal Survival Equipment	13
Hangars and Flying Field Equipment	14
Standard Preservation and Packaging Instructions	15
Machinery, Tool, and Test Equipment	17 & 18
Ground Servicing and Automotive Equipment	19
Descriptive Data Sheets for Aviation Support Equipment	20
Chemical Equipment	24 & 39
Meteorology	50
Ship Installations	51

Part D of Section VIII of the Stock List (letter type directives) is further divided into a number of subsections. Included among those of interest to the Aircrew Survival Equipmentman are Air Crew Systems Bulletins and Changes and BuWeps Aviation Clothing and Survival Equipment Bulletins and Changes.

Equipment Applicability List

The Equipment Applicability List, NavAir 00-500A, is a cross reference index listing of Naval Air Systems Command (NavAirSysCom) publications of aircraft components and related equipment according to model, type, or part number.

Since this index contains several thousand entries, one volume would be very cumbersome to use.

For this reason, this index is divided into several volumes. At the time of this writing, there are seven volumes. Each of the first six volumes contains 400 pages and Volume 7 contains the remaining entries.

With the exception of several small sections in the first part of Volume 1, the Equipment Applicability List is one continuous index of model, type, or part number in alphanumeric sequence.

In addition to an introduction, which explains the headings at the top of each page, the other sections in the first part of Volume 1 pertain primarily to manuals for aircraft, weapons systems, and aircraft engines. Therefore, the publication numbers are listed according to aircraft, aircraft engine, and weapons system designation.

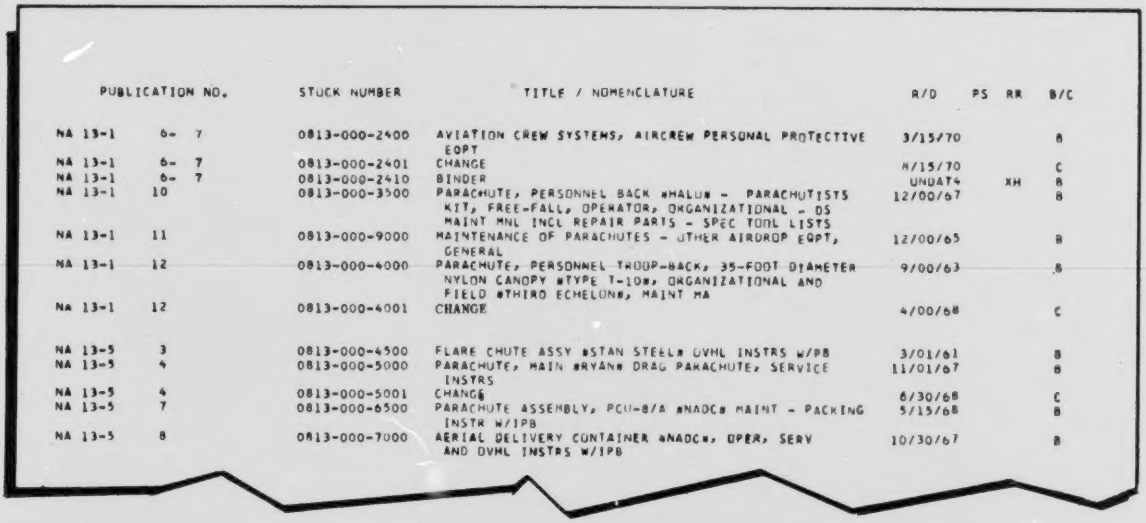
The Equipment Applicability List should be used when attempting to determine what publications are available on a particular item of equipment, and the manufacturer and part number of the item are known.

Aircraft Application List

The Aircraft Application List (NavAir 00-500B) contains a listing of all manuals grouped according to their application to an aircraft. This part of the index does not contain listings of any letter type publications, and all manuals are listed by publication code number only.

A list of basic numbering categories is provided in the front of the book. This list may be used in determining the general type of equipment covered in a publication. For determining the specific item of equipment covered by a publication and the title of the publication, reference should be made to Part C of Section VIII in NavSup Publication 2002.

The Aircraft Application List is especially handy for determining what manuals are available for a particular model of aircraft. Included under each model is a complete listing of applicable manuals. This list includes all allowance lists, accessories manuals, and parachute and personal equipment manuals–NavAir 13–Series, etc., pertaining to that particular model of aircraft.



PUBLICATION NO.	STUCK NUMBER	TITLE / NOMENCLATURE	R/D	PS	RR	B/C
NA 13-1 6- 7	0813-000-2400	AVIATION CREW SYSTEMS, AIRCREW PERSONAL PROTECTIVE EQPT	3/15/70			B
NA 13-1 6- 7	0813-000-2401	CHANGE	8/15/70			C
NA 13-1 6- 7	0813-000-2410	BINDER	UNDAT4		XH	B
NA 13-1 10	0813-000-3500	PARACHUTE, PERSONNEL BACK *HALU* - PARACHUTISTS KIT, FREE-FALL, OPERATOR, ORGANIZATIONAL - DS MAINT MNL INCL REPAIR PARTS - SPEC TOOL LISTS	12/00/67			B
NA 13-1 11	0813-000-9000	MAINTENANCE OF PARACHUTES - OTHER AIRDROP EQPT, GENERAL	12/00/65			B
NA 13-1 12	0813-000-4000	PARACHUTE, PERSONNEL TROOP-BACK, 35-FOOT DIAMETER NYLON CANOPY *TYPE T-10*, ORGANIZATIONAL AND FIELD *THIRD ECHELON*, MAINT MA	9/00/63			B
NA 13-1 12	0813-000-4001	CHANGE	4/00/68			C
NA 13-5 3	0813-000-4500	FLARE CHUTE ASSY *STAN STEEL* OVHL INSTRS W/PB	3/01/61			B
NA 13-5 4	0813-000-5000	PARACHUTE, MAIN *RYAN* DRAG PARACHUTE, SERVICE INSTRS	11/01/67			B
NA 13-5 4	0813-000-5001	CHANGE	6/30/68			C
NA 13-5 7	0813-000-6500	PARACHUTE ASSEMBLY, PCU-8/A *NADC* MAINT - PACKING INSTR W/IPB	5/15/68			B
NA 13-5 8	0813-000-7000	AERIAL DELIVERY CONTAINER *NADC*, OPER, SERV AND OVHL INSTRS W/IPB	10/30/67			B

Figure 4-5.—Example of publication listings in NavSup 2002, Part C. **PR.107**

Directives Application List By Aircraft Configuration

Basically, the Directives Application List by Aircraft Configuration, NavAir 00-500C, is a listing of the active Naval Air Systems Command letter type technical directives (Bulletins and Changes) with respect to their applicability to an aircraft. It serves the same purpose for letter type directives as the Aircraft Application List does for technical manuals. The applicable technical directives are listed, by number, under each configuration of aircraft model. (NOTE: Configuration refers to modifications made to a basic aircraft model. For instance, A-4A, A-4B, TA-4F, etc., are all different configurations of the A-4 aircraft model.)

The directives are grouped according to type under each configuration of aircraft model. The types of directives consist of Air Crew System Bulletins, Air Crew System Changes, Airframe Bulletins, etc.

A "General" Series is included in the last part of NavAir 00-500C. This section consists of those technical directives which are not limited to any specific aircraft but may be pertinent to equipment used in conjunction with all or, at least, several aircraft models. Like the preceding sections of this Index, the listings of directives in the General section are grouped according to type.

Equipment and Subject Applicability List

The Equipment and Subject Applicability List (NavAir 00-500D) contains a cross reference index listing of Naval Air Systems Command letter type directives. There are two parts assigned: Part A, Equipment Index; and Part B, Subject Index.

Part A contains a listing of letter type technical directives on aircraft components and related equipment by model, type, and part number.

Each number will fall in alphanumeric sequence of its cognizant equipment series. The cognizant series are accessories, aircrew systems, armament, avionics, clothing and survival equipment, powerplants, propellers, and support equipment. Due to the lengthy titles in some of the series, there is a title code at the beginning of the series. This code must not be used when ordering specific directives.

Part B, Subject Index, lists letter type technical directives in the following manner: (1) Prime System, (2) Component Part of the System, and (3) Airframe Title, Bulletin/Change number.

Aviation Crew Systems Manual

The Aviation Crew Systems Manual, NavAir 13–Series, is prepared by the Naval Air Systems Command in compliance as directed by the Chief of Naval Operations. This manual provides detailed inspection and maintenance instructions. It consists of seven separately bound volumes as listed below:

1. Inflatable Survival Equipment, NavAir 13-1-6.1.
2. Personnel Parachutes, NavAir 13-1-6.2.
3. Survival Kits and Items, NavAir 13-1-6.3.
4. Oxygen Equipment, NavAir 13-1-6.4.
5. Helicopter Rescue Equipment, NavAir 13-1-6.5.
6. Ejection Seats, NavAir 13-1-6.6.
7. Aircrew Personal Protective Equipment, NavAir 13-1-6.7.

The purpose of each volume is to provide technical information related to the inspection and maintenance of a category of aircrew safety and survival equipment. The information contained in each volume is intended for organizational, intermediate, or depot levels of maintenance as established within the Naval Aircraft Maintenance Program.

NOTE: The Shop Process Cards in each set are arranged in a logical sequence to aid the Aircrew Survival Equipmentman. Each step listed on the SPC includes a paragraph number that refers to the applicable paragraph in the NavAir 13–Series Volume pertaining to survival equipment involved.

Procurement of Publications

There are four main methods of procuring publications relating to naval aircraft maintenance.

The first method is initial outfitting. The Naval Air Technical Service Facility will provide the prospective commanding officer of a newly commissioned or reactivated ship, station, or activity an outfitting of general aeronautic publications.

The second method is aeronautic technical publication outfitting. An Aeronautic Technical Publication Outfitting Allowance consists of those publications applicable to a particular model of aircraft. Initial distribution is provided by the Naval Air Technical Service Facility to a newly commissioned or reactivated activity. Upon change in mission or aircraft custody which requires a different set of publications, the activity must submit a request to the Naval Air Technical Service Facility for an Aeronautic Technical Publication Outfitting Allowance, applicable to the model designation of the aircraft involved.

The third method of procuring publications is through the automatic distribution lists. The Naval Air Technical Service Facility normally provides for the distribution of certain future issues of new and revised publications directly to affected activities. Activities desiring to receive future issues of new and revised publications must submit NavAir Form 5605/3, Mailing List Request for Aeronautic Publications, to the Commanding Officer, Naval Air Technical Services Facility, 700 Robbins Avenue, Philadelphia, Pennsylvania.

The fourth method of procuring publications is by ordering individual publications direct. The Single Line Item Requisitioning System Document, DD Form 1348, is used by activities when requisitioning publications on a one-time requirement. The use of DD Form 1348 or DD Form 1149 will not result in being placed on the automatic distribution list to receive future issues of revisions of the publication ordered.

Detailed information concerning the availability of aeronautic publications may be found in the Naval Aeronautic Publications Index.

Updating of Manuals

Modern technology is constantly changing. What is considered to be the "latest" word today may be modified, totally revised, or otherwise made obsolete tomorrow. This is not always a planned or intended condition, but it must be accepted and dealt with.

These changing conditions apply to aeronautic technical publications. They require that prompt action be afforded to change and revise all material which is related to the technical information and data used by maintenance and operational personnel.

The degree of urgency of updating publications depends upon the type of information involved and the frequency of reference to the affected publications. In any event, technical data change and revision material should not be allowed to accumulate at any one point.

Copies of these changes and revisions, received through the proper submission of NavAir 5605/3 or by the periodic issuance of supplements between issues of the basic lists, are first delivered to the technical library. Personnel of the library, of course, make the necessary changes to the affected publications filed in the library. However, the changes affecting the publications held by the production divisions are routed to the appropriate work center. Personnel of the work center are then required to incorporate the changes into their copies of the affected publications.

The changes or revisions are prepared by the manufacturer of the specific equipment and are issued under the authority of the Naval Air Systems Command. The changes or revisions may direct write-in changes, provide replacement/additional pages, and/or provide information affecting various parts of the manual, in which case the information is prepared as supplemental data.

When incorporating changes, the instructions provided on the front page of the change should be followed exactly. Write-in material should be entered neatly and legibly using indelible ink. Text material to be deleted should have a single line ruled through every line of type.

Supplement data is supplied on pages to be filed next to the affected pages in the manual. Supplementary pages are inserted in the manual in page number order and are identified by a letter added to the page number. For example, if a supplementary page is issued bearing the number 2-16A, it is placed between pages 2-16 and 2-17. The supplementary information may be applicable to either or both of these pages.

Replacement pages are designed to replace pages already in the basic publication. They are numbered in exactly the same way as the pages they replace. The date of the change is shown on the bottom of the page in the corner opposite the page number. Prior to incorporating replacement pages they should be counted and the number noted. When the task is finished, the removed pages should be counted to make sure that the same number were removed as were put in. Also, the bottom of each removed page should be checked for dates to make sure no new replacement pages were inadvertently missed.

On the back of each change notice cover page is a cumulative list of all changed/revised pages issued and the date of issue, since the basic date of the manual. Checking the listed pages and dates against the corresponding pages of the manual, which are also dated, provides one method of determing currency and completion of the manual. This page becomes the cover page of the revised manual.

Maintenance personnel using technical manuals are in a good position to detect errors, omissions, and other discrepancies in these manuals. If reported, the manuals can be corrected and all hands will benefit. Reports of discrepancies should be submitted, using an Unsatisfactory Material/Condition Report (UR), or when provided, a text tear-out form.

MATERIAL PROCUREMENT

Nearly every maintenance task generates a need for supplies of one type or another. These supplies may consist of common everyday items like rags, screws, nuts, bolts, etc., or one of the many hundreds of aircraft or equipment components for which the PR has maintenance responsibility. If the job is to progress smoothly and if the assigned job completion deadlines are to be met, all material needs must be satisfied promptly.

A large number of aircraft and equipment components are reparable. For this reason, replacements for these items are not stocked to the depth that nonreparable items are stocked. In order to keep the supply of reparable items rotating from the shelves to the aircraft (or equipment) to repair and back to the shelves in an efficient and orderly manner, the turn-in of reparable items is stressed to the PR (and all other applicable aviation personnel).

The first part of this section provides a thumbnail sketch of the relationship of the PR and the local supply organization insofar as material procurement is concerned.

The second portion is devoted to handling and turn-in of reparable materials.

Rapid communications is an integral part of the Naval Aircraft Maintenance Program. Every PR should be aware of all the means of rapid communications at his working area (center, station, etc.) and make use of them as necessary in obtaining needed parts or supplies. Such systems as 2-digit telephones, walkie-talkies, and intercoms are typical of the rapid communication systems at various stations. Using such systems greatly reduces the elapsed time between ordering and receiving a part or parts. The PR should use whatever means is available to let his needs be known.

Procedure

When the need for a part becomes evident to a PR who is working at a maintenance task, he immediately notifies his work center supervisor. The work center supervisor in turn notifies the maintenance control chief, requesting a priority. The supervisor then relays the need for the material to material control. Material control, in turn, informs the local supply support center. As knowledge of the need for this part is being pushed along from the worker to the supply activity, each place along the line of communications adds some information. For instance, the worker tells his work center supervisor the name of the part and the quantity needed. The work center supervisor looks up the part number and upon notifying the maintenance control chief tells him that so many of such and such an item is needed for job control number so and so. The work center supervisor assigns a priority for the material. He then communicates with the material control division giving them the following information: Name of needed part, part number, job control number, aircraft bureau number/serial number, quantity required, and delivery point. The material control division enters the necessary information in their register, then informs the local supply support center (SSC) of the number of the part, the priority, and the designated delivery point.

When the material is available locally (on hand in supply), the maximum time allowed for processing and delivery is usually as follows:

Priority	Process/Delivery Time
1-3	1 hour
4-8	2 hours
9-15	24 hours

If needed materials are not available on station, the supply department transmits these needs off station through the proper channels to insure prompt service and follows up on such orders as necessary.

A branch of the local supply support center, the supply response section (SRS), is responsible for delivering the required material to the delivery point designated by the supported organization. In most cases in which no delivery delays are encountered, the needed material is delivered directly to the worker at the job site.

Naturally, there is paperwork involved, but this is taken care of by the supply support center in due time after or while the part is being delivered. The main thing is that the part is not delayed anywhere in the line of communications by paperwork.

The usage of a part or of supplies generally governs how fast it can be placed in the hands of the man on the job. For common items of hardware, rags, etc., the local supply activity maintains stocks in the vicinity where maintenance is being performed. These are known as preexpended stocks; that is, they are written off on their accounts just as if they had been issued, and the mechanics can pick up the desired quantity of these items as soon as they need them. When the stock gets low, the supply activity preexpends another batch and restocks.

For fast moving reparable items of aircraft and equipment parts, an adequate stock is kept more readily available than for slower moving items. *In some cases, such* items may be positioned in a roving van or pie wagon which maintains constant touch with the supply activity by a 2-way radio. In such cases, delivery of a needed part can be accomplished in a matter of minutes.

Material Turn-In

As mentioned previously, it is often necessary that defective parts be turned in to supply. Such parts are known as repairable items; and whenever one is issued for installation, the removed item must be turned in within 24 hours after receipt of the ordered item. The PR is nor normally responsible for the physical return of the item. Defective accountable items are picked up by a representative of the supply department's supply support center for delivery to the local intermediate maintenance activity.

The defective item, if within the repair capability of the AIMD, is repaired and returned to the supply department in an RFI condition. If the defective item cannot be repaired by the AIMD, it is forwarded to the supply screening unit of the supply support center for transfer to the appropriate depot level of maintenance. The AIMD may consider the defective item beyond economical repair and may forward the item to the supply screening unit, recommending survey or salvage.

CHAPTER 5

PERSONNEL PARACHUTE PACKING AND RIGGING

Packing a personnel parachute is more than a matter of inserting a canopy into its container. It is a closely related combination of rigging, inspecting, and packing. However, most of the inspection phases of the operation can be carried out independently. Thus, inspection was discussed separately in Chapter 2 of this training manual. The correct operation of the parachute depends on the methods used in the rigging and packing processes, proper inspection at the required steps as outlined in the SPC (Shop Process Card) decks, and correct assembly configuration. A thorough and general packing procedure must be understood, and the PR must be able to apply this knowledge to most types and configurations of parachute assemblies. However, memory should not be relied upon. The PR is encouraged to review the NavAir Manual 13-1-6.2 and each revision or change. The novice PR may need additional time over and above that prescribed to accomplish a procedural step in a task as referenced in a SPC deck. Attention to detail and learning specialized manipulative skills for each type of assembly will take time.

After a few weeks of practice and instruction, under the loft supervisor this additional time will be shortened until peak performance is reached. Due to the uniformity of the system used in teaching the Navy Aircrew Survival Equipmentman, any two men can soon work in harmony and form a good packing team.

It should be kept in mind however, that speed is always secondary to accuracy. A good Aircrew Survival Equipmentman will regulate his packing speed so that it is consistent with quality and settle down to a good, reliable pace that guarantees packing perfection.

A Collateral Duty Inspector (CDI) is permanently assigned to the production division and has secondary or quality assurance assignments to inspect all work accomplished within the assigned production division. As each phase of the packing and rigging task is completed, the CDI examines the finished work and verifies its correctness. These inspections are carried out in accordance with its specific SPC deck and the NavAir 13-1-6.2 Aviation Crew Systems Manual, Parachutes. Detailed drawings should also be used when some doubt exists about either dimensions, material, or configuration.

PACKING AND SERVICING TOOLS

A set of tools and related equipment is required for each packing table in the loft. Most tools and equipment are stowed in a drawer or container of the packing table.

As a general rule, rigging a parachute in preparation for packing involves tacking or joining various appendages and assemblies to the parachute subassembly. Making tackings necessitates the use of several special type handtools common only to hand sewing.

The most useful of these—the sail needle—is used in passing the thread or cord through the materials being tacked. The difficulty encountered in passing the needle through the various weights and thicknesses of webbing, fabric, and/or canvas makes the use of other tools such as the awl, the sewing palm, and smooth-jawed pliers necessary in rigging a parachute for packing.

SAIL NEEDLES

The most distinctive feature of the sail needle is its broad, three-edged shape in relation to its size. Although the shape of the sail needle sometimes prevents its use in hard, closely woven fabrics, it is still the most useful hand sewing needle for parachute maintenance. It is the toughest needle available and will take a lot of rough use without breaking at the eye, as do many of the round needles.

Sail needles are issued in various numbered sizes. The larger the number, the smaller the needle. The most popular sizes are the 14 and 16, shown in figure 5-1 along with the No. 10.

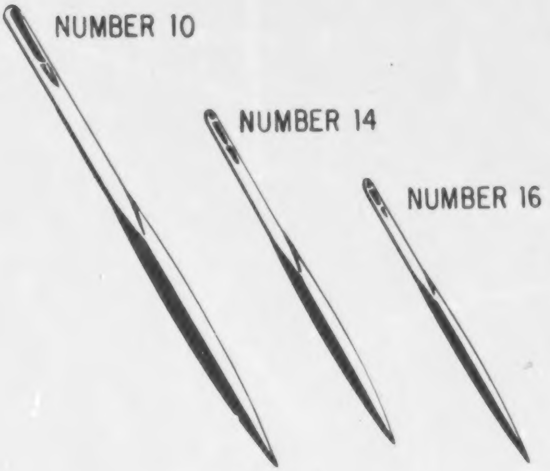


Figure 5-1.—Sail needles. PR.145

When selecting a needle for use, remember that the eye is intended to offer just enough resistance to the thread or cord to keep the needle in place and prevent it from sliding out of position. The cord or thread should pass freely through the eye of the needle. Difficulty is encountered in passing a needle through a piece of cloth when the needle is threaded with a cord too heavy for the eye. The choice of size therefore depends on the size of thread or cord to be used in sewing. An improper selection will interfere with speed and efficiency and increase the possibility of damaging the material.

SAILMAKER'S PALM

The sailmaker's palm is a small metal disk insert, stitched into a leather glove type device. It is designed to be worn in the palm of the hand and is used to aid in pushing a sail needle through the material being sewn or tacked. (See fig. 5-2 (11).)

AWL

The awl (9) is another instrument used as an aid in sewing heavy material where pushing the sail or hand sewing needle through the material becomes difficult. It is a sharp pointed instrument, with a handle attached, and is used for punching holes in a heavy fabric or material prior to inserting the needle. Never use a hot needle or iron as a substitute for the awl.

PLIERS

Other tools which aid in hand sewing are pliers (8), either the needle-nosed or the combination slip-joint type. In either case they must be smooth jawed or wrapped with protective tape to prevent damage to the needle.

Among miscellaneous rigging tools needed in the parachute loft are a sharpening stone, for keeping needles, awls, and knives in tip-top condition; a knife for miscellaneous cutting; and a soldering iron or hot wire device or other suitable instrument for searing nylon. Additional tools and packing aids are illustrated in NavAir 13-1-6.2.

LONG BAR

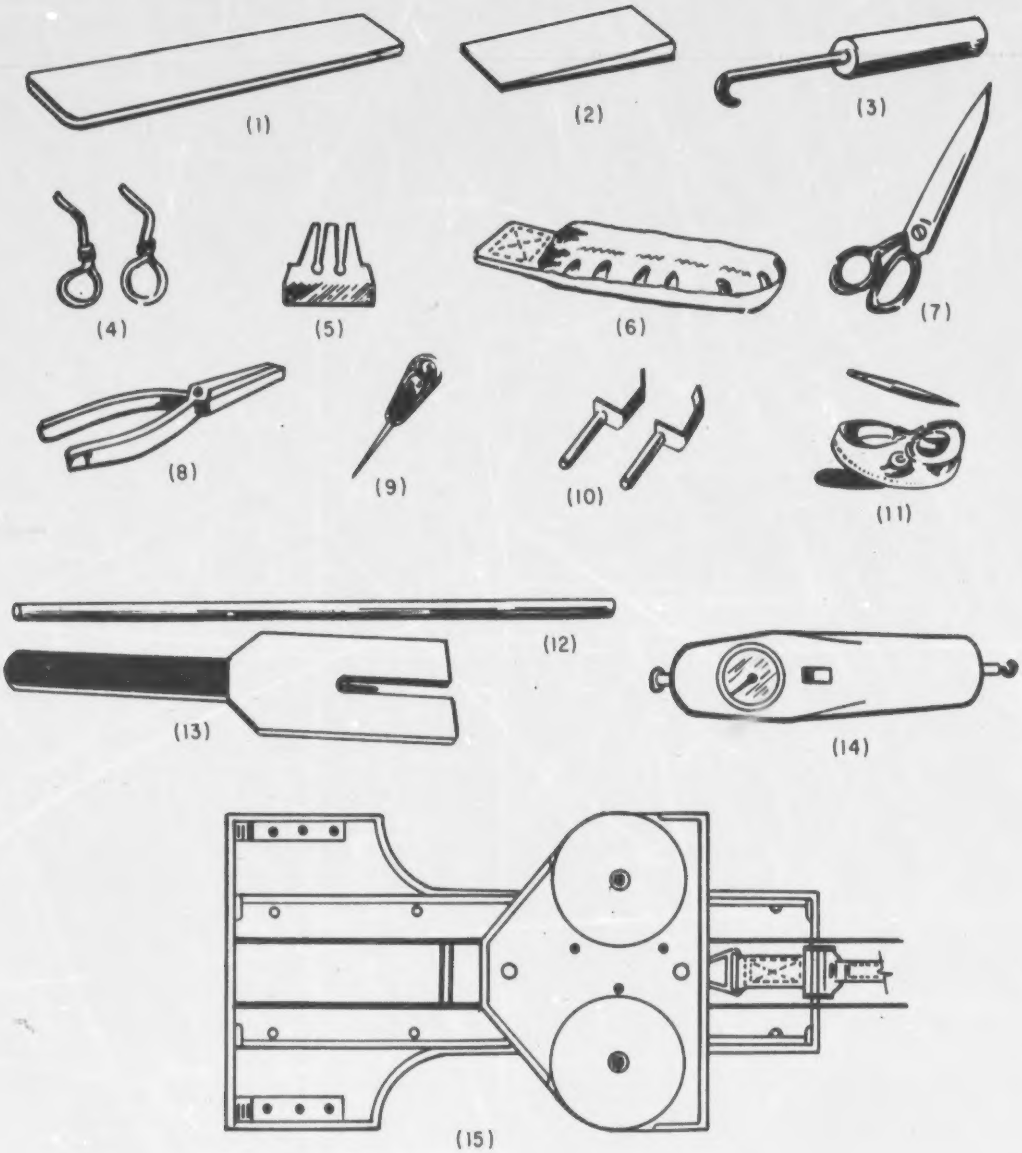
The long bar (1) is a long, flat, rectangular piece, usually of aluminum, approximately 1- 5/8 inches wide, 18 inches long, and one-fourth inch thick. The edges must be rounded and the entire surface smoothed to prevent damage to the fabric of the canopy. It is used to fold the parachute canopy into the container and to aid in smoothing out the container after canopy stowage.

FID

The fid (2) is usually made of aluminum and is about 8 inches long and the same approximate width of thickness as the long bar. It is used after the ripcord is installed to stow the end and corner flaps and to remove any wrinkles and bulges of canopy fabric inside the container.

SHOT BAG

Shot bags (6) are canvas bags approximately 1- 3/4 inches in diameter and 15 to 18 inches



PR.146

Figure 5-2.—Packing, servicing, and special tools. (1) Long bar; (2) fid; (3) suspension line hook; (4) temporary locking pins; (5) suspension line holder; (6) shot bag; (7) scissors; (8) pliers; (9) awl; (10) tension hooks; (11) sailmaker's palm; (12) pilot chute guide tube; (13) pilot chute locking pin plate; (14) spring scale; (15) parachute packing board.

long. They are filled with lead shot or sand and provide weight necessary to keep the canopy in place during the packing procedure. The shot bag, along with the suspension line holder "fingers," helped to retain the suspension lines in their correct position during suspension line stowage.

SUSPENSION LINE HOOK

The hook (3) may be of any type or variation that the PR finds easiest to use. It must be made of a suitable metal that is strong and durable enough to pull the suspension lines through the hesitator loops when stowing the lines in the container. The hook must be kept smooth and free from all burrs and rough edges.

TEMPORARY LOCKING PINS

Temporary locking pins (4) are usually made of stainless steel wire in the general configuration shown in figure 5-2.

After the canopy and pilot chute have been positioned in the container, the container side flaps are closed and the temporary locking pins inserted to hold the container closed while installing the ripcord pins.

SUSPENSION LINE HOLDER

The suspension line holder (5) is made of aluminum and is designed in the general shape of three fingers. Two slots are recessed between the "fingers" into which the suspension lines can be temporarily placed after line continuity has been checked. When placed in these slots and held in place by shot bags, the lines will remain straight and in proper order until ready for stowage in the hesitator loops.

Due to the light weight of nylon and its susceptibility to damage, special care must be taken to avoid any action which might damage the material of the parachute assembly. Particular attention should be given to any tool which might come in contact with the canopy or suspension lines. Burrs and rough areas on any of the metal packing tools and aids must be removed, using O grit emery cloth.

PILOT CHUTE GUIDE TUBE

The pilot chute guide tube (12) is a packing tool utilized when preparing the pilot chute for installation. Position the pilot parachute vertically on the table and insert the guide tube into the grommet located in the crown of the pilot parachute. The guide tube will extend to the bottom of the pilot parachute and be positioned over the locking cone located on the spring base plate. Compress the pilot parachute spring and remove the guide tube from the locking cone. The locking cone must protrude through the grommet. Insure that the pilot parachute cloth is not twisted around or entangled in the compressed pilot parachute spring.

PILOT CHUTE LOCKING PIN PLATE

The pilot chute locking pin plate's pin (13) must be inserted into the bottom hole of the locking cone that protrudes through the grommet in the crown of the pilot parachute.

Place the pilot parachute on top of the canopy with the pin plate positioned on the helper's side of the packing table.

Aline the pilot parachute locking cone with the applicable side flap grommet. After positioning the side flap grommet over the locking cone in the pilot parachute, insert a temporary locking pin into the top hole in the pilot parachute locking cone and remove the locking pin plate from the locking cone.

SCISSORS

Scissors ("shears") (7) are used to cut fabric or webbing. Shears are available in several types, such as trimmer shears, bent trimmers, and pinking shears. Pinking shears are equipped with a saw-toothed inner edge on the blades for making zig-zag cuts, thus reducing the possibility of fabric or thread fraying. Scissors and shears must never be carried loosely in pockets or extended toward other personnel point first.

TENSION HOOKS

During the parachute packing procedure, tension is applied to the parachute canopy as it lies on the packing table. Tension hooks "spades" (10) are used to attach the suspension line connector links to the packing or lower end of the table. Tension is applied at the peak of a canopy by means of a tension strap attached at the upper end of the table.

SPECIAL TOOLS

Certain parachute assemblies require the use of special tools and packing aids in order to accomplish the rigging and packing procedures. Two of these special tools are shown in figure 5-2.

Packing tools and equipment must be counted prior to and after rigging and packing a parachute. All tools must be accounted for, to insure that no tool is inadvertently packed into the parachute container. Be especially attentive to the placement and number of safety pins and/or pennants during the tool counting phase.

PACKING BOARD

The packing board (15), shown in figure 5-2, is a tool used to route and tension the suspension lines with the anti-squid lines attached to the connector links. Basically it consists of a board and two large spools. The packing board is used when packing the NES-8B and MBEU parachute assemblies.

SPRING SCALE

The spring scale is an instrument used in the ripcord pull test. It measures and records the amount of pull force required to remove the ripcord pins from the locking cones. (See fig. 5-2 (14).)

All parachute assemblies are subjected to a ripcord pull test prior to being unpacked for inspection. The maximum pull force allowable is 27 pounds (60 pounds for the LW-3B assembly). If the maximum pull force is exceeded, the ripcord pins, cones, and grommets must be inspected for bends, dents, and roughness. Insure that the ripcord cable moves freely in the housing. Inspect the housing for sharp bends or dents. Replace the damaged parts as necessary. Silicone spray may be applied sparingly to ripcord parts. Insure that the ripcord pins are properly positioned prior to testing.

NOTE: Due to the use of pyrotechnic devices on various assemblies, the following precautions are cited to insure safety of personnel performing inspection and maintenance operations:

1. NB-11, NES-12A, NES-12C, NES-15A, NES-16A assemblies: Carefully raise the folded canopy at the top end of the container, exposing the ballistic spreading gun. Open the fasteners on the extractor sleeve and insert the safety pin in the gun.

2. NB-7E, NES-15A, and LW-3B assemblies: Carefully remove the tacking from the static line cutter cover and slide back the cover. Insert the safety pin in the static line cutter.

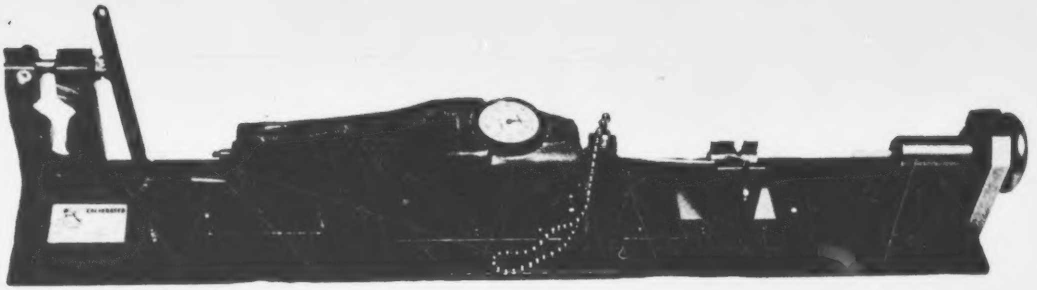
3. All assemblies that employ a cartridge operated parachute actuator: Insure that the automatic actuator arming cable is not pulled while the actuator is armed. To disarm, open the actuator pocket slide fastener and base plate protector flap. Remove the actuator from the pocket. Remove the locking screw and slide the barrel, piston, and the receiver from the cover assembly. Hold the arming pin in position until the barrel and piston have been removed from the receiver. Remove the cartridge from the barrel immediately after the barrel and piston assembly are removed.

SPREADING GUN TEST FIXTURE

The spreading gun test fixture, shown in figure 5-3, is used when replacing the cartridge and also to measure the gun firing pin pull force. The safety pin must be installed during this operation.

A firing pin pull force check must be made each time the cartridge is replaced. The cartridge has a service life of 5 years from the date of manufacture, or 30 months after its removal from the hermetically sealed container, whichever occurs first.

The amount of pull force exerted on the lever until the firing pin releases the striker varies between 25 and 38 pounds. Any spreading gun not within these firing pin pull force limits must be retested twice more. The gun must pass both retests. When a gun fails, it must be removed from service and returned to supply for analysis.



PR.117

Figure 5-3.–Ballistic spreading gun test fixture.

AUTOMATIC PARACHUTE ACTUATOR TESTER

The automatic parachute actuator tester, shown in figure 5-4, is designed to test the sensitivity of the automatic actuator to a preset pressure altitude through use of an aneroid blocking mechanism.

The principal sequential action to be tested is the consistency of the aneroid in actuating the release mechanism upon exposure to a predetermined altitude. Normal test procedures involve evacuating air from the test chamber to simulate an increase in altitude to a predetermined value above the preset altitude of the actuator.

At this point the arming pin, which locks the parachute actuator firing mechanism, must be extracted remotely. Ambient outside air is bled back at a controlled rate into the test chamber to simulate a specific rate of decreasing altitude. When the pressure reaches the value for which the automatic actuator has been set, the aneroid will unlock the sear if its pressure sensitivity is within the tolerance limitation.

The test chamber, evacuation system, instrumentation, and controls are packaged in one container as shown in figure 5-4. The test chamber is designed to withstand a vacuum induced altitude of 30,000 feet. The chamber accommodates the entire 7000 series automatic parachute actuator and includes the necessary bracketry to support and position the actuator within the chamber during the test cycle. An access door and observation window are also provided.

NOTE: Before testing an automatic parachute actuator, the test chamber altimeter should be checked, and set if required for a reading of 29.92 inches barometric pressure.

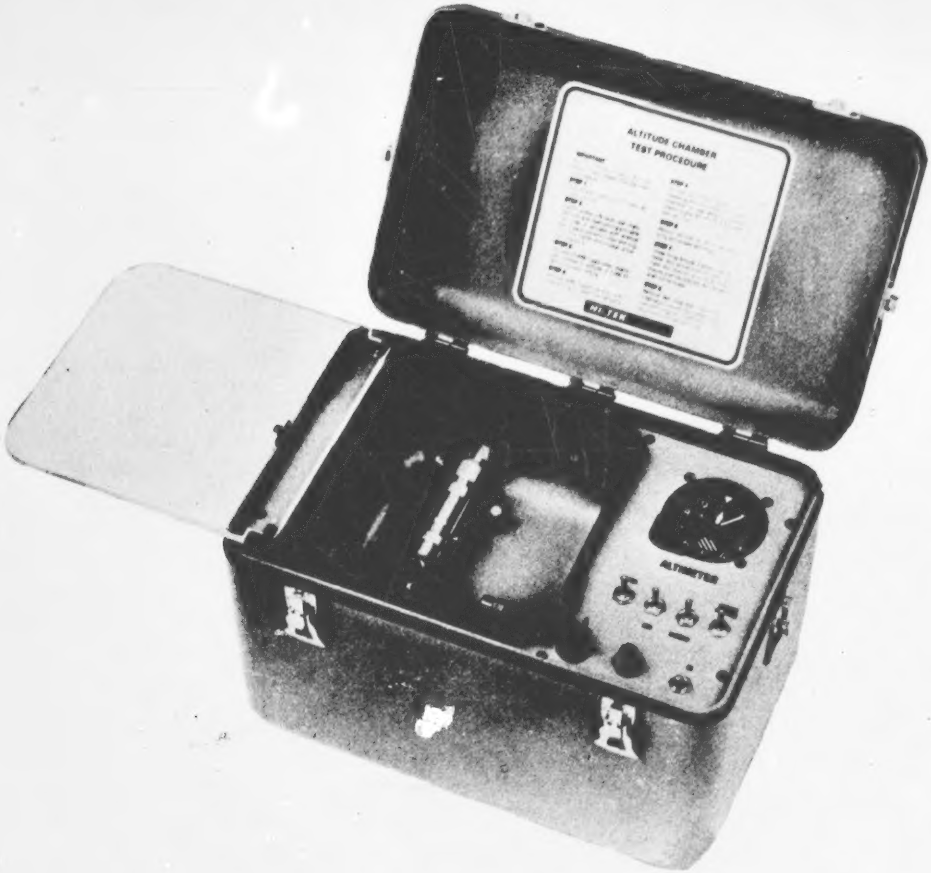
Actuator Test Procedure

Plug the test unit's power cord into a 115-volt, 60 Hz, a-c power source. Place the power switch in the ON position, open the test chamber door, and insert the arming pin cable into the side of the actuator with the aneroid end toward the operator.

Install the test slug (dummy cartridge) in the end of the actuator barrel and engage the actuator snap lock. Actuate the CLIMB toggle switch to evacuate the test chamber to a simulated altitude of 2,000 feet above that at which the actuator has been set.

Actuate the ARM toggle switch to withdraw the arming pin cable from the actuator. Actuate the DESCEND toggle switch, causing a valve to open allowing outside air to flow into the test chamber. This increases the pressure, thereby decreasing the simulated altitude at a rate of 175 to 200 feet per second.

Record the altitude at which the actuator firing pin strikes the test slug. Perform three altitude firing checks and any actuator which does not meet the test requirements on all three checks must be rejected. Adjustments to automatic actuator aneroids are not authorized.



PR.118

Figure 5-4.—Automatic parachute actuator tester.

Remove the test slug and examine the indentation caused by the hammer firing pin; the indentation must be present. Discard the used test slug.

SUSPENSION LINES

Suspension line entanglements (dips and twists) are caused either by the canopy or harness passing in between the suspension lines, or by one suspension line or a group passing around another group of lines in excess of 360 degrees. In chapter 3 we studied the proper method of attaching the suspension lines to the connector links and in turn how the links are attached to the lift webs of the harness.

REMOVING ENTANGLEMENTS

In separating the lines to check for dips and twists, first find the gore bearing the nameplate and place it uppermost in the center of the table. Separate the suspension lines into two equal groups, left and right, by counting 14 lines on each side of the nameplate gore of a 28-foot diameter canopy. If any lines are tangled, they will not run clear from connector link to canopy skirt, and the dip or twist must be removed.

A DIP is a line or group of lines passing THROUGH another group of lines. A TWIST is a line or group of lines passing AROUND another group of lines. Do not pack a parachute with a dip or twist in the suspension lines. This would prevent proper opening of the parachute.

Most twists may be removed by simply unwinding the lines in the opposite direction of the twist, but dips present a much more difficult problem. There are two commonly used methods by which dips may be removed–the two-group method and one-line method.

The two-group method is satisfactory when there are only a few dips in the suspension lines. With the parachute hooked up loosely, separate the suspension lines at the skirt into two groups. Hold one group in each hand and work toward the harness, separating the two groups as you go. This forces the dips down to the link end of the suspension lines and makes it possible to see them clearly. Still holding the suspension lines, have the helper take the suspension line connector links off of the spreader bar and pass the harness and container through the suspension lines wherever one line passes through the rest. Care must be used not to tangle the harness while passing it through the lines.

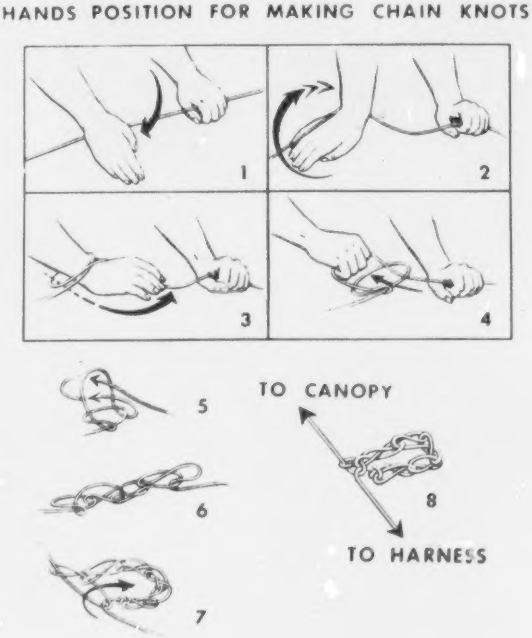
The one-line method of removing dips is usually used if there are a large number of dips and twists in the lines. However, either method may be used according to your own personal preference.

Lay out the parachute as for the two-group method. Pick up either line No. 1 or line No. 28 and, while holding it loosely in one hand, walk toward the harness. With the other hand, form a loop of all the lines around the hand. Hold the single line and place all the lines that go over this over the arm and those that pass under the line, under the arm. Pass the container and harness through the loop thus formed.

The last step in removing dips and twists from the suspension lines by either method is to check the lines for continuity. This is the only positive method of determining if the job has been properly done. To check the lines for continuity the packer should stand at the skirt hem and, starting with suspension line No. 1, lift the lines away from the group one at a time while the helper checks the same line at the connector link to make sure that each line is in sequence.

CHAINING

Suspension lines are chained by tying a series of hitches to form a chain. Grasp the lines at a point near the skirt hem and make an overhand knot. Reach through the loop of this knot and grasp the lines again and pull them through the loop. This makes the first hitch. Tighten the loop of the first hitch and repeat the process of reaching through the loop of each successive hitch and pulling through another loop until the entire length of the suspension lines is chained. Pull all of the chained lines through the loop of the last hitch to complete the chain. (See fig. 5-5.)



PR.147

Figure 5-5.—Steps in chaining suspension lines.

KNOTS USED IN PARACHUTE MAINTENANCE

In addition to the knots used in chaining the suspension lines, PR's must learn how to tie the other knots required in parachute maintenance procedures. Some of the knots which PR's need to know are shown in figure 5-6.

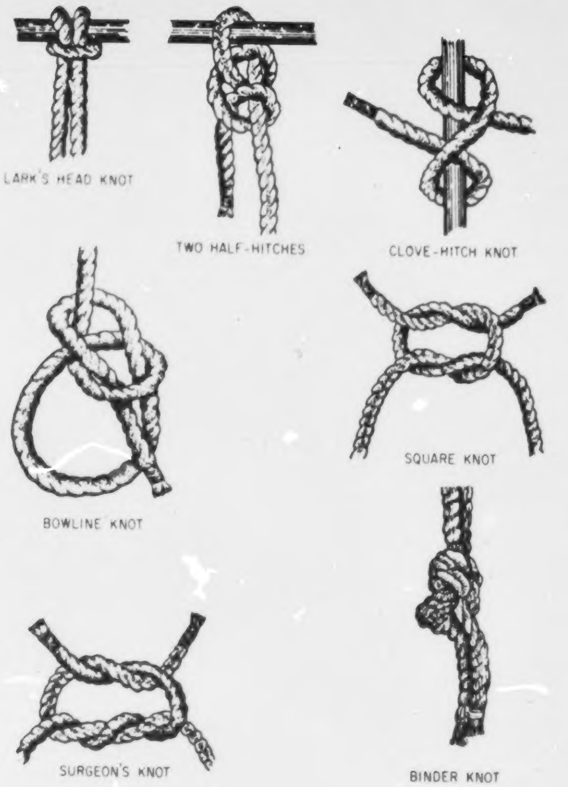


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Figure 5-6.—Knots and hitches used in parachute maintenance.

The lark's head knot is formed around an attachment ring, group of lines or bar by passing the free ends of the line around the bar or through the ring and then through a loop or bight in the line. This knot is used to attach some pilot parachute connector straps and cords.

A half-hitch knot is formed by passing a cord or line around an object, then passing the free end around the main part of the cord and bringing the free end up through the loop thus formed. The half-hitch knot is used to finish the tying of the suspension lines to the connector link.

The clove-hitch knot is formed by making one turn around a post, bringing the end across the line, continuing around the post a second time and passing the end under the second loop. The clove-hitch is used to tie the suspension lines to the connector links.

A bowline knot is formed by making a small overhand loop a desired distance from the end of the line. The end of the line is then passed through the loop from the underside of the main part of the line and back through the small loop. When this knot is drawn tight, it will not slip but still can be easily untied. The bowline knot is used to secure the pilot parachute to the pilot parachute connector cord, and the cord to the main canopy.

The square knot is formed by passing the end of the cord held in the left hand over and under the end of the cord held in the right hand and then reversing the process by passing the end of the cord held in the right hand over and under the cord held in the left hand. The square knot is often used to back up or follow a surgeon's knot and it may be used in most cases in which a knot is required and a particular knot is not specified.

A surgeon's knot is similar to the square knot, except that the first overhand tie is wrapped twice around the cord or line, thus holding the material tight until the knot is completed. The surgeon's knot is used in making many various tackings on the parachute harness and containers.

A binder knot is the simplest method of joining two threads or lines. The two ends are placed side by side and a simple, overhand knot is then tied in both lines simultaneously. The binder knot will not slip when drawn tightly. This knot is also called a thumb knot.

PARACHUTE PACKING FUNDAMENTALS

Parachute packing fundamentals, including techniques and procedures, have been discussed in this Training Manual in the applicable chapters as they relate to specific type parachutes.

Technical knowledge also plays a large part in the fundamentals of maintaining a good safety program. The complexity of our modern escape and survival equipment systems demands the close attention of well-informed and expert PR's; otherwise, our systems cannot be properly maintained. Technical knowledge is a function of education and training which, incidentally, does not end with graduation from Class A school. Graduation is only the beginning. Any PR worthy of his rate and rating is continually training and learning through self-study and application, and through a personal desire for proficiency and self-betterment. However, technical knowledge by itself is not sufficient unless it is coupled with an old-fashioned craftsmanship that provides gratification and keen satisfaction in a job well done.

The PR who wishes to contribute to safety and improved reliability must know his job and develop professional pride in the quality of his work.

It is the continuing duty of everyone connected with aircrew survival equipment, to discover and eliminate unsafe work practices. Accidents which are caused by such practices may not occur until a much later date, and their severity cannot be predicted. Their consequences however may range from simple material failure to major accidents resulting in serious injuries or fatalities.

UPDATING CONFIGURATIONS

The Aviation Crew Systems Manual, Parachutes, NavAir 13-1-6.2 contains information and instructions pertaining to the configuration, function, application, packing, inspection, maintenance, modification and storage of parachute assemblies. Previously this information was contained in numerous directives and various other documents.

NavAir 13-1-6.2, Parachute Manual, now takes precedence over all other documents with the exception of:

1. Aircrew systems bulletins and changes listed in the interim change index.
2. All bulletins and changes issued after the date of the latest interim change index. At quarterly intervals, an interim change index page listing all effective bulletins and changes will be issued. This page will be inserted into the manual immediately following the list of changed pages issued (A page).

All bulletins and changes not listed in the change index as being effective, except those dated after the date of the latest index, must be removed and discarded along with the superseded interim change index. All bulletins and changes, and other documents incorporated by the manual are listed in Appendix A.

Bulletins and changes which are partially incorporated are listed in Appendix B. In the period between revisions to the manual, directives will be issued in the form of Aircrew Systems Bulletins and Changes. These bulletins and changes must be inserted in Appendix C.

The Parachutes Manual, NavAir 13-1-6.2, will be updated semiannually by the issuance of a List of Changed Pages Issued which will list all revised, added, and deleted pages. Insert this list in front of the manual immediately following the title page. Revised and added pages, appropriately dated, will be issued with the Index and should be inserted into the manual according to their page number. The replaced and/or deleted pages and the superseded list should be discarded.

The PR must compare the configuration of the parachute assembly with the applicable tables of modifications listed in the Parachutes Manual, NavAir 13-1-6.2 and update the configuration as required.

PRELIMINARY TESTS

The preliminary tests, inspections, and maintenance consist of the following:

1. Ripcord pull test.
2. Laying out the assembly.
3. Service life check.
4. Contamination inspection and removal.
5. Cleaning.

Parachute assemblies must be subjected to these preliminary tests prior to the packing phase. There are variations of the preliminary test procedures, depending on the type of parachute concerned. For this reason, reference to NavAir 13-1-6.2 is highly recommended.

CHAPTER 6

NC-3 PERSONNEL PARACHUTE ASSEMBLY

The NC-3 personnel parachute assembly is a chest type parachute used primarily in transport and patrol type aircraft. The advantage of the NC-3 in these types of aircraft is mobility, as aircrewmen ordinarily wear only the harness during flight. With the quick-fit harness, aircrewmen can be ready for bailout in a matter of seconds.

The NC-3 parachute assembly includes a 28-foot diameter, flat, circular, nylon canopy with 28 gores. The canopy is packed in a container assembly secured to the aircrewman's chest by means of a harness assembly.

Two different configurations of the NC-3 parachute are in service. These configurations are (1) the basic NC-3 assembly; and (2) the NC-3 assembly with the standard soft pack attached.

The standard soft pack is one of several types of packaged LR-1 life rafts.

RIGGING THE BASIC NC-3 ASSEMBLY

At the time of issue, the NC-3 parachute assembly must be rigged as described in the following paragraphs. Subsequent rigging of the NC-3 assembly must be accomplished in the same sequence, omitting the nonrequired steps. It is not always necessary to break and remake the tackings that go together in the rigging of certain appendages.

PRELIMINARY PREPARATION

Lay out on the packing table all required packing tools, inspect the packing tools for serviceability, and count and record the number of packing tools to be used.

Lay out the parachute canopy full length on a clean packing table. Position the canopy gore containing the nameplate uppermost in the center of the packing table. Separate the suspension lines into two groups, couning 14 lines on each side of the nameplate gore. If necessary, attach the pilot parachute to the canopy peak using 1,000 pound tubular nylon.

Arrange the two groups of 14 suspension lines on each side of the nameplate gore in accordance with figure 6-1 as viewed from the connector links. The numbers in figure 6-1 illustrate the location and orientation of the suspension lines when attached to the skirt hem and the connector links.

⑦⑥⑤④③②① ㉘㉗㉖㉕㉔㉓㉒

⑧⑨⑩⑪⑫⑬⑭ ⑮⑯⑰⑱⑲⑳㉑

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Figure 6-1.—Arrangement of the suspension lines on the connector links.

Place the connector link holding suspension lines 1 through 7 on top of the connector link holding the suspension lines 8 through 14. Place the connector link holding the suspension lines 22 through 28 on top of the connector link holding the suspension lines 15 through 21. Connect these two groups of connector links to their respective tension hooks on the packing table.

NOTE: The knurled portions of the connector link yoke and plate assemblies must face up and the screwheads must face outboard.

Attach the back cushion to the harness assembly by laying out the harness assembly on the packing table in a position that would have the wearer face down on the table with his head toward the canopy. Position the back cushion underneath the harness with the keepers released. Secure the diagonal backstraps under the upper corner keepers and the horizontal backstrap under the two bottom center keepers.

At this point the Parachute History Card requirements should be initiated.

SUSPENSION LINE CONTINUITY CHECK

Attach a tension strap at the canopy vent lines and tighten. When viewed from the riser end of the packing table, the suspension lines must be arranged on the skirt hem and the connector links as shown in figure 6-1. The suspension lines must run free from the skirt hem to the connector links without dips or twists.

The packer must start with suspension line number 1 on the left side of the nameplate gore and work through line 14. The helper must be positioned at the connector links to check continuity of the suspension line selected by the packer. The same procedure is used on the right side of the nameplate gore except that the packer must start with line number 28 and work through line number 15.

ATTACHMENT OF CONNECTOR LINKS TO THE RISER ASSEMBLY

Position the riser assembly at the connector link end of the suspension lines. The spring loaded guard of the quick connector snaps must face up and the corresponding lift webs must be placed on top of each other.

Remove the connector link yoke and plate assemblies. Insert the bottom connector links into the bottom lift web loops and the top connector links into the top lift web loops. Reattach the yoke and plate assemblies and tighten screws to a torque value of 20 to 25 pound-inches.

Apply a tamper dot to each connector link screw head using (TT-L-32) color 11136 insignia red lacquer.

NOTE: Insure the knurled portions of the connector links face up and the screw heads face outboard.

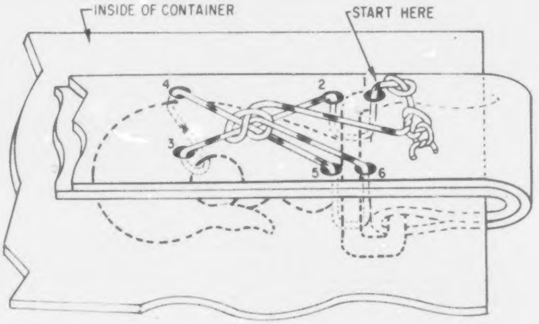
ATTACHMENT OF THE PARACHUTE CONTAINER TO THE RISER ASSEMBLY

Position the container under the riser assembly, with the inside facing the packing table and the ripcord pin protector flap facing the canopy. The riser assembly cross connector strap must be positioned on top of the container, just inside the container frame, with the spring-loaded guard of the quick-connector snaps turned away from the container.

The NC-3 lift web assembly tacking must be properly made to hold the pack securely while the parachute is being worn and at the crucial time of egress from the aircraft. This tacking must be drawn up tight to prevent slippage during hookup to the harness.

To make the tacking, position the container on the end with the side flap with locking cones on the table and the lift webs inserted through the slots on the upper edge of the container.

With the container and the riser in position, connect the container and riser as shown in figure 6-2.



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1. Container.
2. Shank.
3 & 4. Snap hooks.
5 & 6. Snap slots.

Figure 6-2.—Lift web tacking of the NC-3 parachute container.

Tack the quick connector snaps to the container bottom using waxed nylon 6-cord, doubled. Tie a simple overhand knot approximately 6 inches from the end of the cord.

Starting from the inside of the container (1), butterfly tack through the lift webs and around the snap slot at one side of the shank (2), around the snap hook (3, 4), through the inside of the container, and around the snap slot at the opposite side of the shank (5, 6). Pull the thread tight and tie off the ends with a surgeon's knot followed by a square knot, ending on the inside of the container.

PACKING THE NC-3

Lay out the packing tools on the packing table and check for nicks, burrs, or sharp edges which may cause damage to the parachute assembly. Count and record the number of packing tools.

Lay the container on the packing table with the inside facing up and the ripcord pin protector flap turned away from the canopy. Insert the tension hooks into the suspension line connector links. Turn the container over so that the inside faces the packing table and the side flap containing the locking cones faces away from the canopy. Attach the tension strap hook to the loop in the pilot parachute connector cord at the canopy vent and tighten. (See fig. 6-3.)

Recheck the continuity of the suspension lines and pull the canopy vent collar below the vent hem.

The helper straightens the vent hem by entwining his fingers through the suspension lines and working the lines back and forth through the loop in the pilot parachute connector cord until the vent hem is straight.

Manipulating the vent hem in this manner usually straightens both the vent and skirt hem. It is more difficult to straighten a vent hem when excessive tension has been applied.

Check the information found on the nameplate of the canopy and compare with that found on the Parachute History Card; update the information recorded as necessary.

Pull the vent collar back to its original position after the vent hem has been properly alined. Apply tension at the peak of the parachute; the exact amount of tension necessary for whipping and folding of the canopy cannot be specified, since the tension varies with the personal wishes of the packer. The parachute should be tight enough to draw the suspension lines to the center of the table, but not so tight as to be difficult to hold up to shoulder level while whipping and folding the canopy. (See fig. 6-4.)

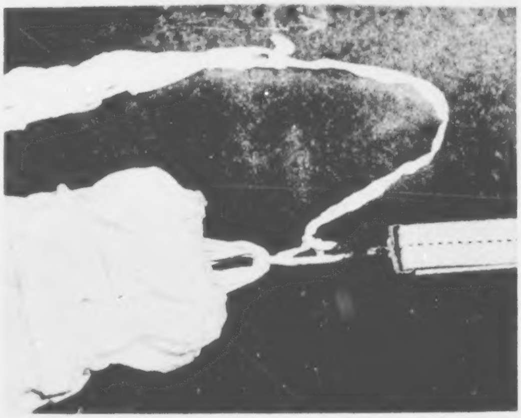

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Figure 6-3.—Attaching the tension device to the loop in the pilot parachute connector cord.

Both members of the packing team should be able to see the entire gore on the inside when the suspension lines are held at shoulder level. This is an instance in which personal experience is necessary to find the tension which suits you most. Practice packing (especially stowing suspension lines and whipping and folding the canopy) until you develop skill and dexterity of movement.

The next step is to whip and fold the canopy. The packer and helper should work simultaneously from opposite sides of the table at the skirt hem. In beginning the whipping and folding, grasp the two top inboard lines and look back to the links to make sure that the lines are free and clear of entanglements. Raise the lines to a level where the inside of the canopy can be clearly observed to the peak. Visually follow the skirt hem to the next suspension line. Pick up this line and swing it in a wide arc toward the person on the opposite side of the table, bringing it up to shoulder level and holding it in this

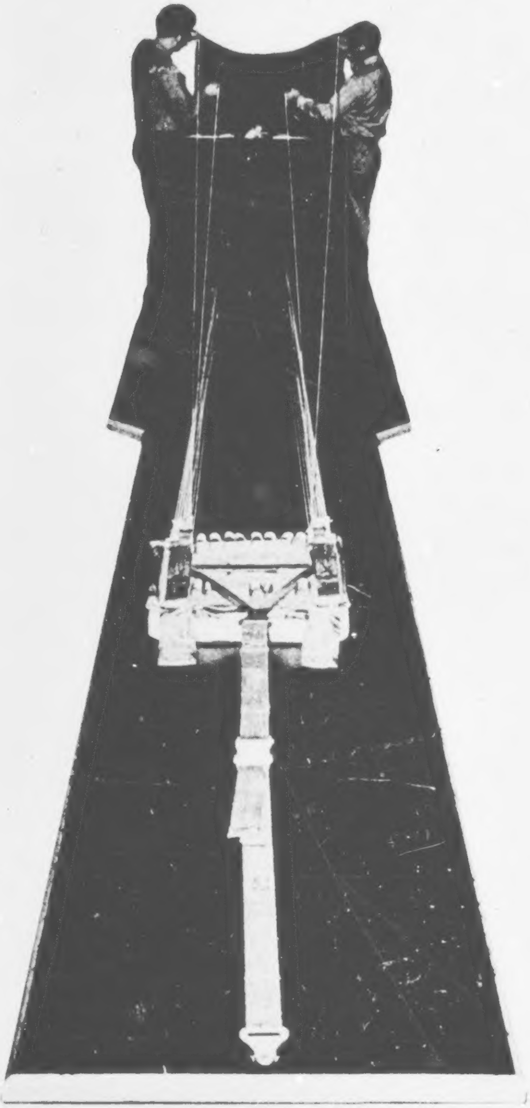

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Figure 6-4.–NC-3 under tension and ready for whipping and folding.

position. Look down this line on the inside of the canopy to the peak and make sure that no folds from the previous gore have overlapped the suspension line in view. Repeat this process around the canopy until each gore is folded in half and each suspension line is held in place in its proper rotation. There will now be two gores remaining between the two sets of suspension lines which have not been folded. Stretch the two sets of lines to the outermost edges of the packing table, as shown in figure 6-5. Each member of the packing team should grasp all of the folds at their outer edge and grip them firmly. While holding the suspension lines at the edge of the table, move the folds up and down rapidly in a whipping motion. This motion will assure that most of the wrinkles put into the fabric by the folding action are removed.

To make the last two folds, the packer reaches over the suspension lines with his left hand and grasps the center of the top gore, while the helper reaches underneath the lines with his right hand and catches the center of the bottom gore. On a signal, both packer and helper swing their group of suspension lines in an arc toward the center of the table (the packer arcs downward and the helper upward) while at the same time pulling the top and bottom gores to the outer edges of the table. (See fig. 6-6.)

The last fold on the helper's side is made on the bottom of the other folded gores. It therefore requires special attention in straightening all wrinkles from skirt to peak.

Insert the suspension lines in the slots of the suspension line holder and place a shot bag across the lines to hold them in place. The lines may now be released by both packer and helper. Place a shot bag on the folds of the canopy on the packer's side. Whip all of the folds on the helper's side to the packer's side, except the bottom gore. The packer should remain at the skirt hem to hold the folds and suspension lines in position while the helper (starting at the skirt hem) pulls the bottom fold out of its proper position throughout the length of the canopy.

NOTE: Do not pull or brush too hard on this fold, or the opposite fold may be disturbed. When the helper reaches the peak, the packer then flips all of the folds, positioned above the shot bag, back to their original position on top of the bottom fold on the helper's side of the table. The helper then proceeds to brush out any remaining wrinkles in the folded canopy.

The packer must now rotate all of the gores as a group, except the bottom gore, from the left over to the right side of the packing table. He straightens and smooths the bottom gore on

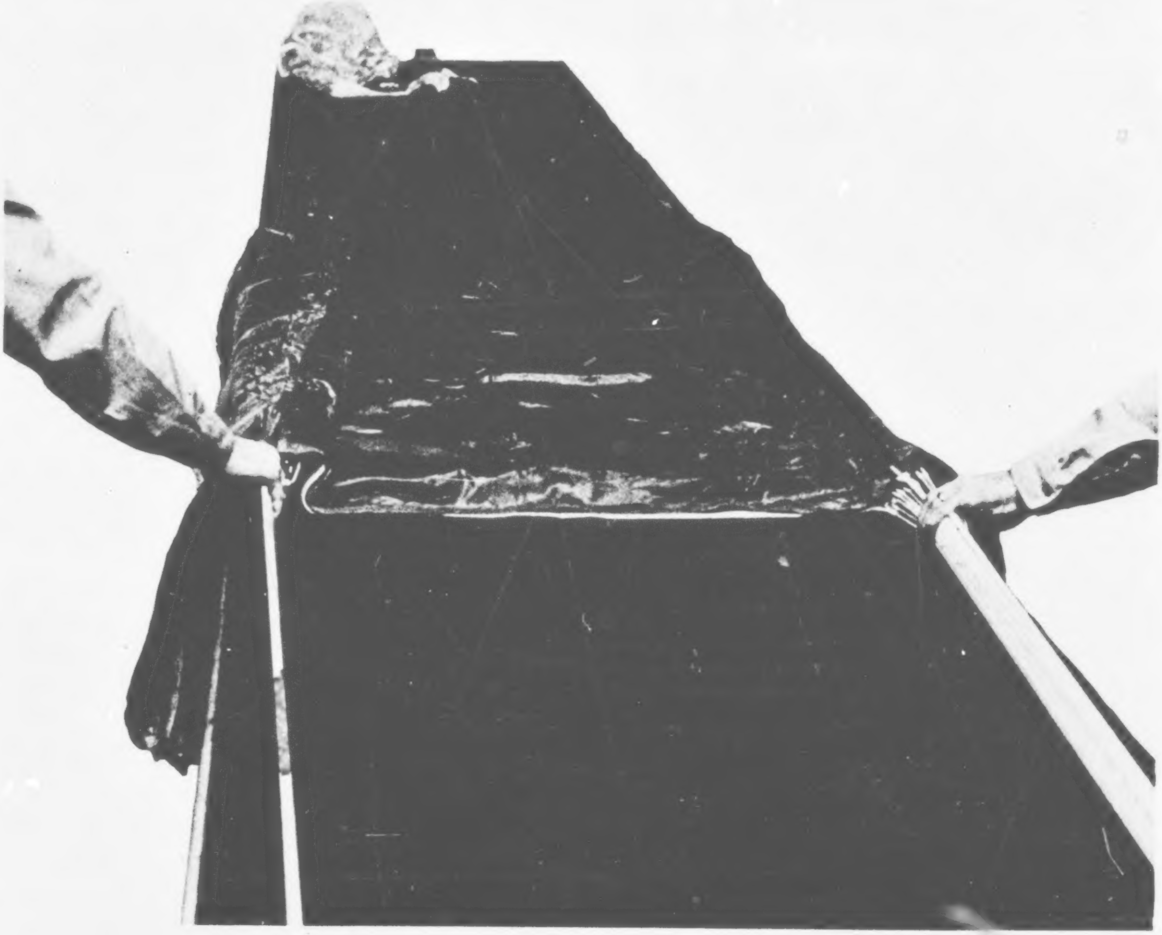

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Figure 6-5.–Suspension lines stretched to outer edge of table in preparation for whipping the folds.

the left side of the packing table throughout its length to the peak.

The helper returns the folded gores above the shot bag to the left side of the packing table so that the packer can straighten and smooth the top gore.

Figure 6-7 illustrates the method of folding the skirt hem back in preparation for straightening and alining the gores.

Each folded gore must be alined and counted when placed back onto the packing table as shown in figure 6-8.

The skirt hem must be made neat by having all V tab reinforcements alined in the same direction on top of each other. Each group of folds on the left and right side of the suspension lines must contain 14 gores.

The canopy must now be folded in thirds by the packer placing his hand on the helper's side of the skirt hem approximately 6 inches from the suspension lines. The helper rotates the gores over the center of the canopy to the left side of the packing table.

The helper now must place his hand on the packer's side of the skirt hem, approximately 6 inches from the suspension lines. The packer rotates the gores over the center of the canopy to the right side of the packing table. The two

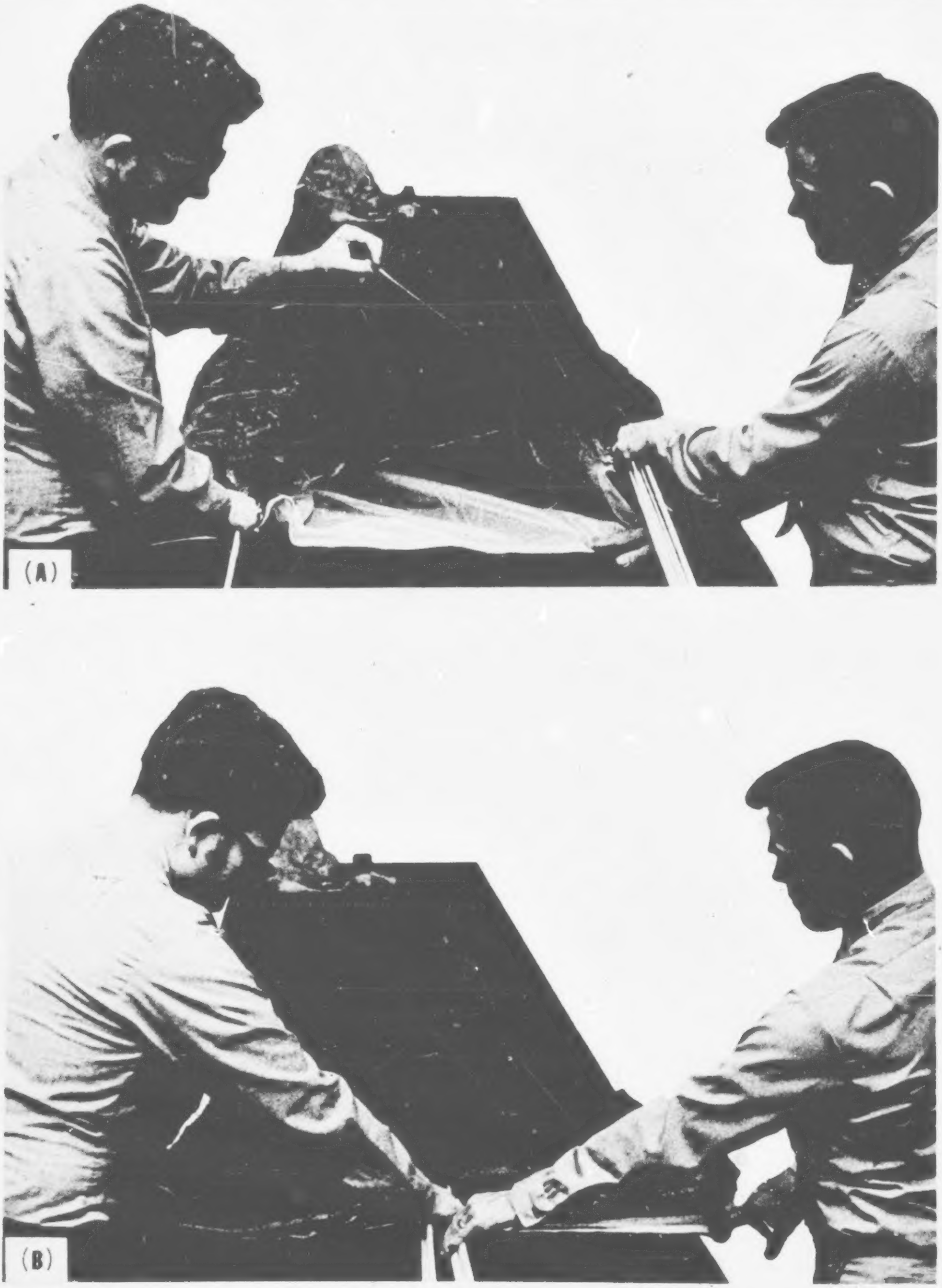

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Figure 6-6.—Completing last two folds of canopy. (A) Gores being grasped in the center prior to moving suspension lines to center of table; (B) lines brought to the center and skirt hem folds towards table edge.

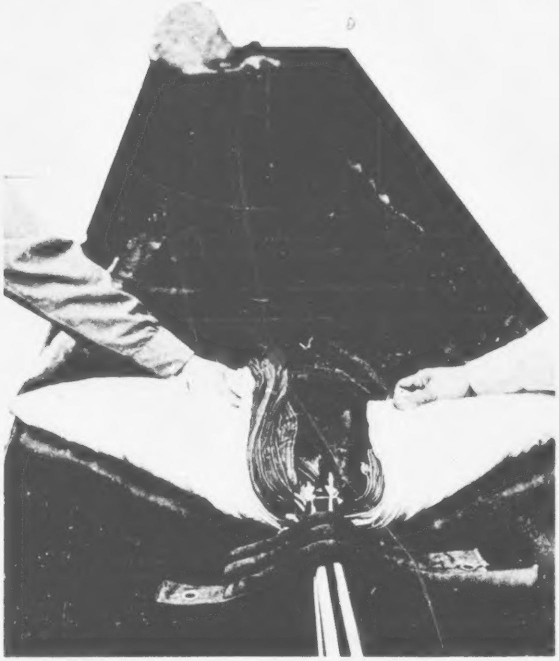

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Figure 6-7.—Folding the skirt hem in preparation for straightening the hem.

groups of folded gores will overlap. Note that the canopy cannot be folded throughout its entire length but breaks approximately 2/3 the distance to the peak as shown in figure 6-9.

Place a shot bag slightly behind the skirt hem and another one at the middle of the canopy. Remove the tension strap hook from the loop in the pilot parachute connector cord and place the pilot parachute on top of the canopy.

Turn the container over so that the inside faces up, ripcord pin protector flap is turned away from the canopy, and the lift webs are positioned on top of the container. Remove the tension hooks from the connector links and remove the hooks from the work area.

Fold the side and end flap under the container. Install two new suspension line retaining bands on the extreme left hand loop of the lower row of hesitator loops using a larkshead knot. The packer must grasp both groups of suspension lines approximately 22 inches from the connector links to make the first bight. (See fig. 6-10.)

NOTE: Do not use old retaining bands; new bands must be used each time the assembly is packed.

Insure that there are equal amounts of suspension lines in both groups, from the connector links to the hand. The canopy is drawn along the packing table only in sufficient lengths to permit each bight to be formed. The packer forms a bight in the suspension lines at the hesitator loop (rubber retaining band) closest to the canopy and closest to the helper.

NOTE: During the stowing operation, insure that the suspension lines do not become loose or rotated and that no lines are left out of the retaining bands. The suspension line rubber bands must lie flat around the bight.

The helper assists the packer during the stowing operation by holding the container steady and by holding the completed bight while the next bight is being formed. The packer draws the bight through the rubber retaining band to the container frame edge, but not beyond. (See fig. 6-11.)

The packer draws the suspension lines and folded canopy toward the container to form the second bight at the hesitator loop farthest from the canopy and nearest to the helper. Again the helper must assist the packer by holding the container steady and by holding the completed bight while the next bight is being formed. The stow must be positioned through the hesitator loop to the container frame's edge, but not beyond.

The packer forms a third bight in the suspension lines at the hesitator loop (remaining rubber band) closest to the canopy and on the helper's side. The packer draws the bight through the rubber retaining band to the container frame edge, but not beyond.

The fourth bight is formed in the same manner as discussed in the previous paragraphs; the bight is pulled through the hesitator loop next to the first stow. Continue stowing suspension lines in the hesitator loops as shown in figure 6-12.

Repeat the process of stowing suspension line bights alternately from one side to the other until all hesitator loops and rubber bands are filled. Remove all wrinkles from the hesitator loops and rubber bands, using the temporary locking pin as a straightening tool. (See fig. 6-13.)

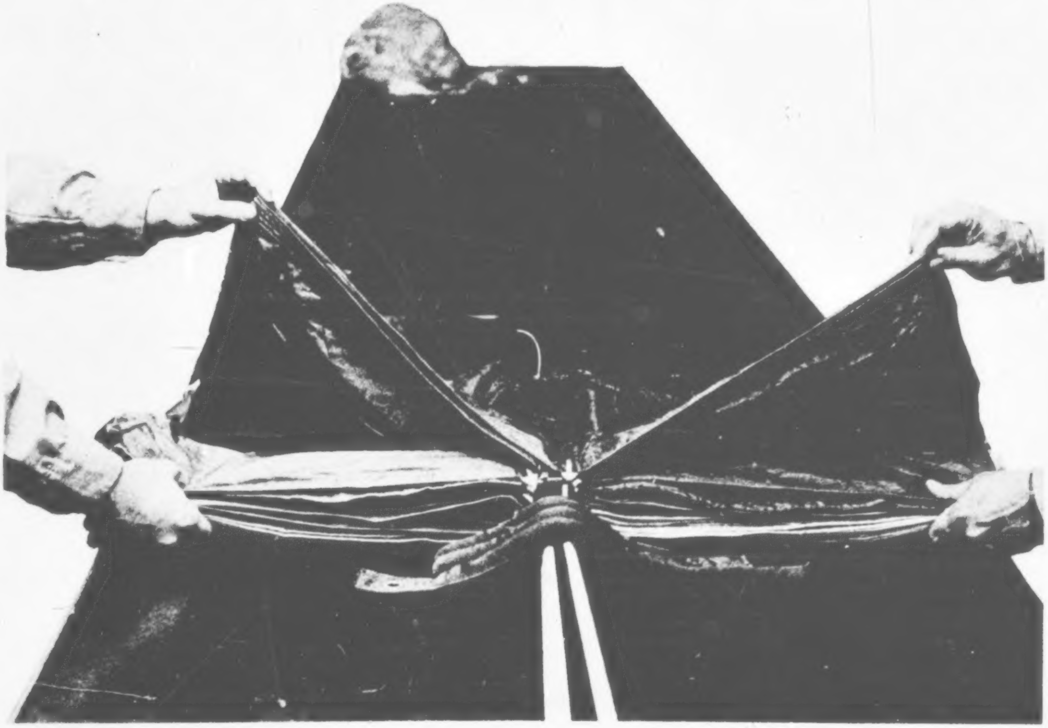

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Figure 6-8.—Alining and counting the gores at the skirt hem.

When the suspension lines are stowed in all of the hesitator loops, there should be 14 to 20 inches of lines remaining between the skirt hem and the last bight taken. This permits bringing the skirt hem up to the far edge of the container. Rotate the parachute container 90 degrees clockwise; the canopy is now ready for stowage into the container.

Pull the side and end flaps out from under the parachute container. Remove the suspension line separator and place the lift web protector flaps on top of the lift webs. Remove the shot bag from the canopy skirt hem. The helper places the long bar over the suspension lines, parallel with the upper container edge.

The packer must grasp the canopy skirt hem on each side of the suspension lines and draw the canopy across the container. The skirt hem must be alined with the bottom container edge, allowing the folded canopy to extend approximately 2 inches over the sides of the container as shown in figure 6-14.

Remove the remaining shot bag from the canopy. The helper removes the long bar from between the canopy and the container and places it on top of the canopy, parallel with the upper container edge. The packer must grasp the canopy approximately one container length from the long bar and draw the canopy across the container. (See fig. 6-15.)

The second fold must be positioned slightly behind the skirt hem as shown in figure 6-16, with the sides of the canopy extending 2 inches over the sides of the container.

To make the third and fourth folds, the helper must use the long bar in the same manner as with the first and second folds. The fourth fold is extended to aline with the skirt hem as shown in figure 6-16.

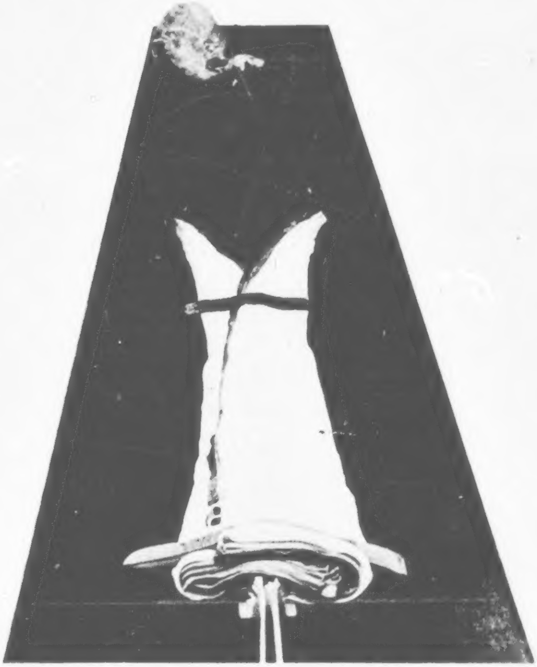

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Figure 6-9.–Canopy folded to proper width.

Continue accordion folding the remainder of the canopy into the container, maintaining the 2 inch overlap on the sides of the container. As the peak of the canopy is drawn close to the container, the pilot parachute must be placed back onto the packing table.

When insufficient canopy remains to continue folding operation, the canopy must be folded under approximately 9 inches from the peak. (See fig. 6-17.)

The folded under portion of the canopy must be positioned on top of the canopy to form the uppermost fold. Adjust the canopy as required, to obtain neat and square folds. Rotate the container 90 degrees counterclockwise.

Inspect the pilot parachute connector cord for entanglements. Position the pilot parachute on top of the folded canopy with the bridle eye in the center. Insure that the pilot parachute cloth is not twisted around or entangled in the compressed pilot parachute spring. Gradually compress the pilot parachute fully on top of the canopy as shown in figure 6-18. Roll the pilot parachute cloth under the outer edge of the crown.

To close the parachute container the packer and helper must pull the pilot parachute protector flap, located on the side flap containing the locking cones, over the canopy while holding the pilot parachute compressed. (See fig. 6-19.)

The protector flap on the side flap containing the locking cones must be held in place.

Pull the pilot parachute protector flap located on the side flap containing the grommets over the canopy and place it on top of the protector flap from the opposite side. Keep the canopy movement to a minimum and avoid disturbing the canopy folds.

Pull the side flap containing the locking cones over the pilot parachute protector flaps and hold in place. Pull the side flap containing the grommets over the side flap containing the locking cones.

Insert the temporary locking pins into the locking cones, noting the direction of the locking pins as shown in figure 6-20.

Straighten the pilot parachute protector flaps and insure that they are properly overlapped. Arrange the canopy folds at each end of the container to obtain neat, square corners.

The helper pulls the corner flaps together on the ripcord handle pocket side of the container, and the packer pushes down on the side flaps.

The packer holds the side and corner flaps together with his fingers in the pockets. The helper pulls the end flap over the top of the container, placing the metal end tab over the cones as shown in figure 6-21.

The packer holds the metal end tab over the locking cone as the helper removes the temporary locking pin. The helper then reinserts the temporary locking pin from the outboard side of the locking cone, securing the metal end tab in place. The opposite end flap is closed and secured in the same manner, inserting the temporary locking pin from the outboard side of the locking cone. Insure that the temporary locking pins are inserted properly.

Partially insert the ripcord handle with the bend facing up into the ripcord handle pocket. The packer carefully removes the temporary locking pin from the locking cone nearest the

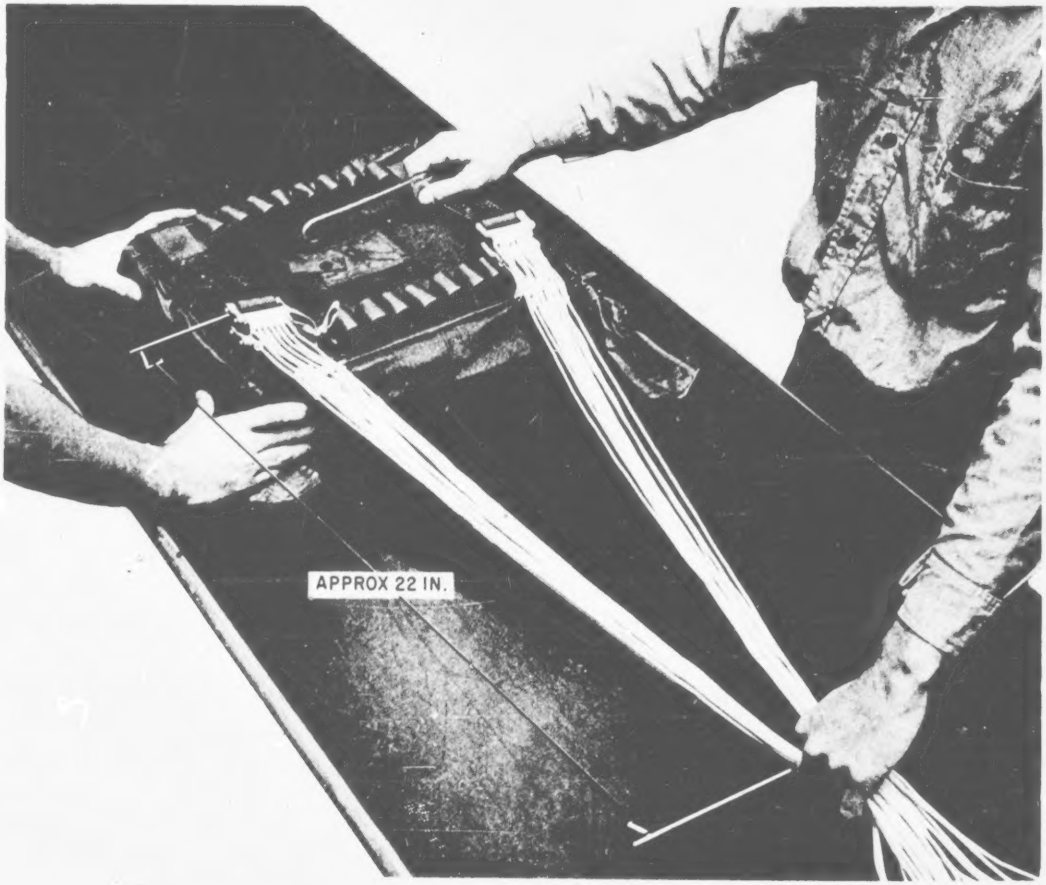

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Figure 6-10.–Gaging length of suspension lines required for making first bight.

ripcord pocket. The helper, at the same time, inserts the top ripcord pin into the locking cone.

Remove the temporary locking pin from the second locking cone and insert the bottom ripcord locking pin in the same manner as the top ripcord pin, inserting the ripcord handle in the elastic ripcord pocket as shown in figure 6-22.

NOTE: Insure that the ripcord pins are centered in the locking cones so that the shoulder of the ripcord pin is not jammed against the hole in the locking cone, but extends more than 1/4-inch beyond the base of the grommet.

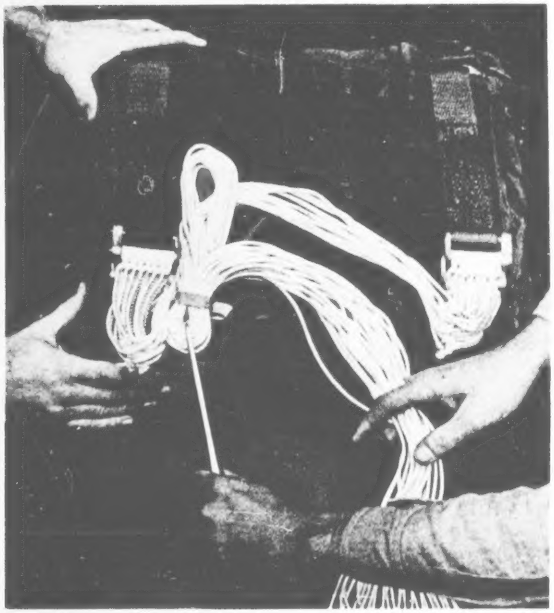
Insert the long bar under the end flap from the direction of the side flap containing the ripcord protector flap as shown in figure 6-23.

NOTE: Improper insertion of the long bar into the container may cause the bar to enter the pack and disturb the arrangement of the canopy folds or flaps.

Push downward and work the long bar in a "sea-saw" fashion to shape the pack and remove any wrinkles. Shape the opposite end of the pack in the same manner.

Push the four corner flaps firmly into the container, using the packing fid inserted into the pockets as shown in figure 6-24.

Insure that the corners are firm and square with no canopy cloth exposed. Insert the packing fid into the pockets at corners of both side flaps and push firmly into place, smoothing the



PR.163

Figure 6-11.—Stowing the first suspension line bight.

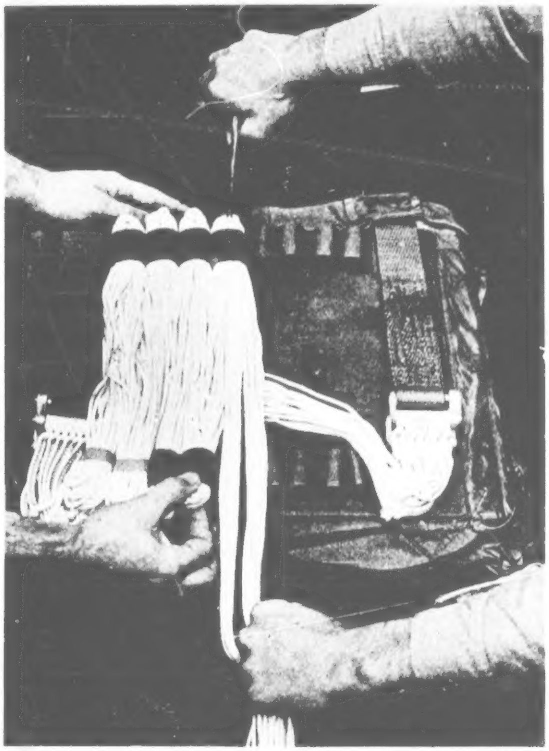
container cloth as required. Insert the packing fid into the pockets of the lift web protector flaps and push firmly inward, straightening the flaps.

Attach four container spring opening bands to the eyes on the side flaps. The openings in the band hooks must face down. Attach two container spring opening bands to the eyes on the end flaps. Insure that the container spring opening bands are reeved between the container and riser assembly as shown in figure 6-25.

Insert the ripcord pin lock and attach a spring scale to the ripcord handle by means of a nylon cord. Using a straight steady pull, observe the initial movement of the ripcord pins. The maximum allowable force is 27 pounds. (See fig. 6-26.)

Remove the ripcord pin lock upon completion of the ripcord pull test. Snap the ripcord pin protector flap closed.

Count and record the number of packing tools, and insure that all the tools are accounted for. Fill out and sign the Parachute History Card. Insert the GND/AIR Emergency Code Form, NavAir 00-35-513, and the Emergency Uses of Parachutes, NavAir 00-80T-53 into the packing data card pocket.



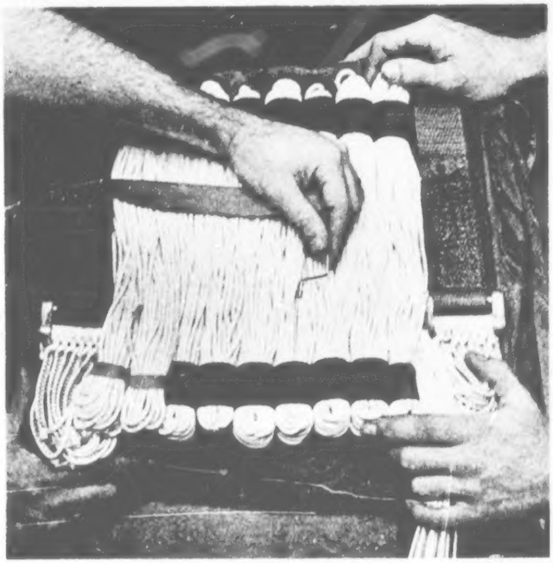
PR.164

Figure 6-12.—Stowing suspension lines.

CHEST HARNESS ASSEMBLY

The harness is that part of the parachute assembly that secures the body of the wearer to the parachute and provides support during descent. The NC-3 chest harness differs from the seat and back types in its method of attachment to the parachute container and lift-web assembly. The container is made readily attachable to the harness by the engagement of a pair of quick-connector snaps which form part of the lift-web assembly with two D-rings located at chest height on each side of the main sling. (See fig. 6-27.)

When it is required to use the NC-3 parachute, the quick-connector snaps are snapped into the D-rings on the harness. The cross-connector



PR.165

Figure 6-13.—Straightening the hesitator loops and rubber bands.

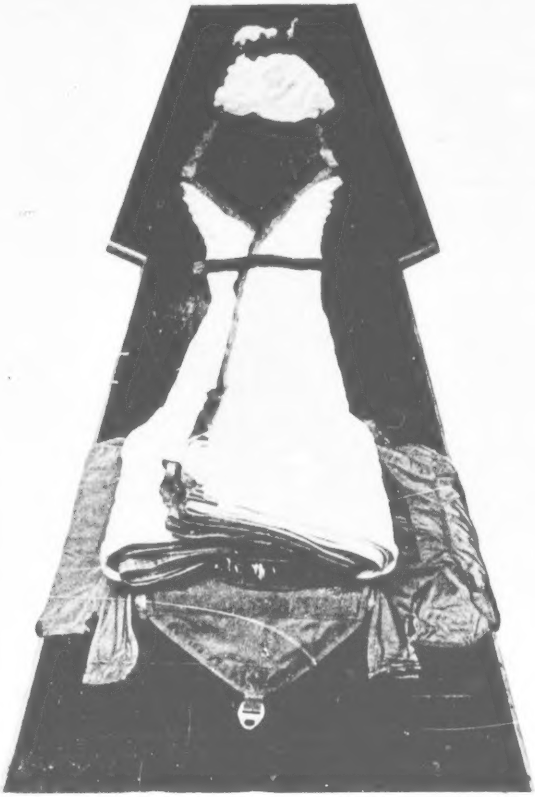
strap keeps the parachute canopy from deflating or collapsing in the event that only one quick-connector snap and D-ring are connected before an emergency descent.

Designated as auxiliary straps on the chest harness are the leg straps, diagonal straps, chest straps, and a horizontal back strap.

These straps secure the body firmly in the main sling. There are two leg straps, two chest straps, and one horizontal back strap. The hardware on the harness is made of cadium plated alloy steel.

For added comfort to the wearer, a back pad is attached to the harness straps as discussed below.

Lay out the harness assembly on the packing table, oriented in such a way that the wearer would be facing down on the packing table with his head towards the canopy, and position the back pad underneath with the keepers released. Secure the diagonal backstraps under the upper corner keepers and the horizontal backstrap under the two bottom center keepers. (See fig. 6-28.)



PR.166

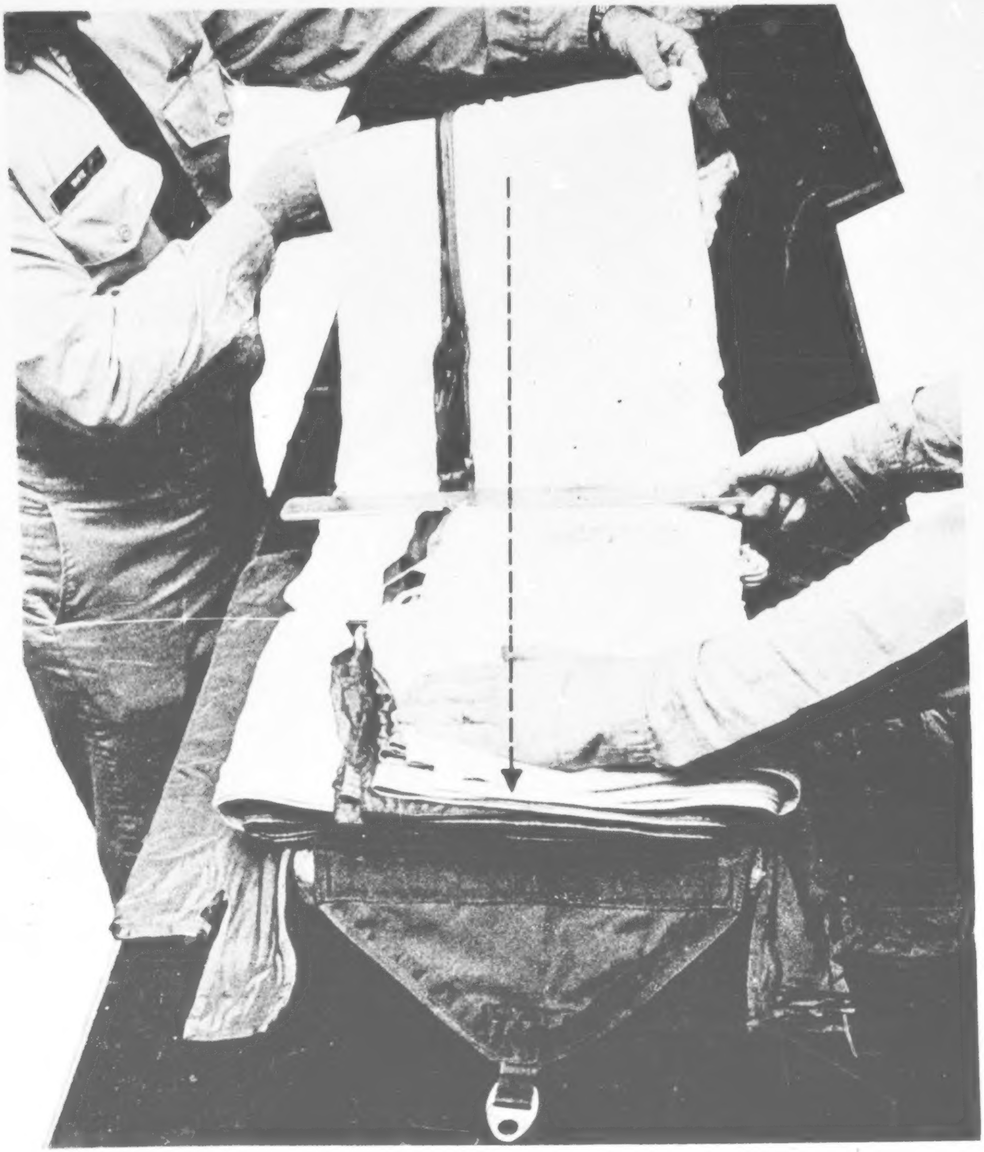
Figure 6-14.—Canopy skirt positioned on the container.

HARNESS ADJUSTMENTS

One of the most important responsibilities of the PR is the training of personnel in the use of parachutes and other survival equipment. All naval aviation personnel should know how to don and adjust the quick-fit parachute harness and how to hook the NC-3 parachute to the harness.

The quick-fit harness is designed to be adjusted for body length before the aircraft becomes airborne. The leg straps and chest straps may be adjusted when needed.

Since the harness is designed to serve as a seat or sling to support the wearer during descent, it must be fitted comfortably while the

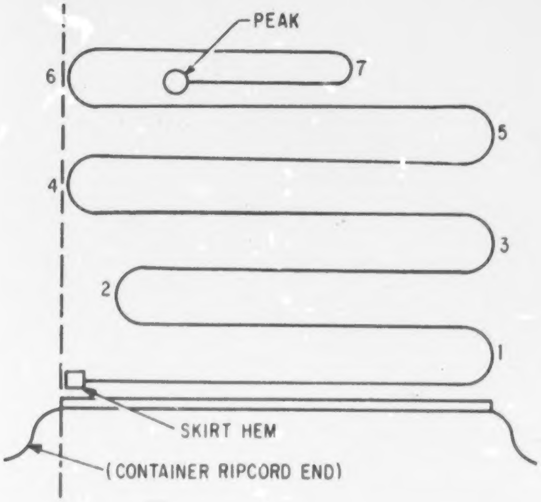


PR.167

Figure 6-15.—Making the first fold in the canopy stowage.

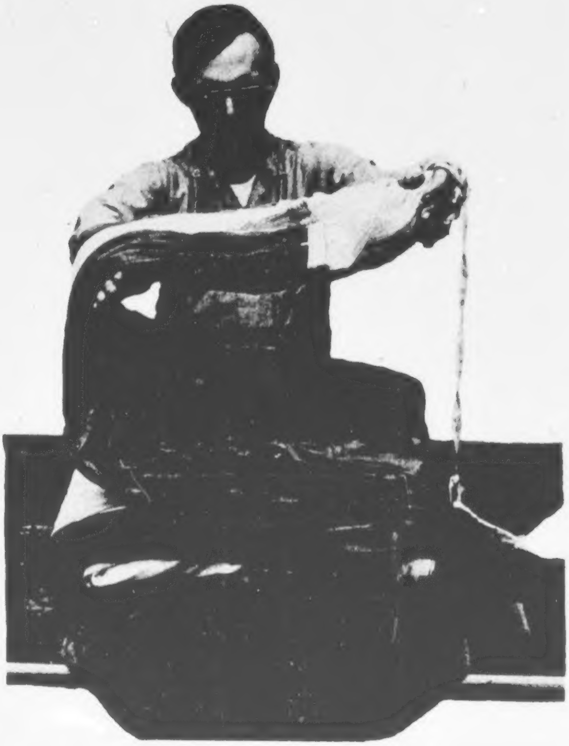
body is in a seated position. Therefore, all quick-fit adjustments are made either in a sitting or simulated sitting position.

To don the harness, slip the arms between the back straps and the chest straps positioned on each side of the harness. Grasp the main sling on both sides and slide it down over the buttocks to form a sling or seat underneath the body. Sit down in a straight chair, or assume a simulated sitting position by bending forward 45 degrees, bending at the waist and holding the trunk straight. (See fig. 6-29.)



PR.168

Figure 6-16.—Stowage of canopy.



PR.169

Figure 6-17.—Folding the canopy peak under.

The harness should fit the body snugly and comfortably lengthwise when in this position. If it does not, remove the harness and adjust for proper body length. This adjustment is made by moving the shoulder adapters—up to shorten or down to lengthen. After adjustment for length, don harness and reassume the original position for donning. While in this position, adjust the leg and chest straps to a snug comfortable fit.

It will be noted that the properly adjusted harness is extremely uncomfortable when an attempt is made to stand erect. For this reason the harness may be worn loosely for comfort while moving about in the aircraft, and quickly adjusted to the wearer when the need arises. This feature, coupled with the fact that the harness may be worn without the parachute being permanently attached, makes the NC-3 parachute desirable for use in aircraft in which members of the crew are required to move about in the performance of their duties.

It is important to stress that personnel should learn to adjust their harness from the stooped position since rarely will anyone have time to look for a seat in which to adjust his harness when the need arises to use the parachute for an emergency descent. A person should be able to don his harness and chute and prepare to jump from any point in the aircraft.

ATTACHMENT OF THE STANDARD SOFT PACK TO THE NC-3 PARACHUTE CONTAINER

Attachment of the soft pack container to the parachute container must be performed prior to packing the parachute in order to prevent inadvertent stitching of the canopy or suspension lines when making the required hand tackings.

Insure that six 10-inch lengths of type III nylon cord are tied to the standard soft pack outer container as shown in figure 6-30.

Position the standard soft pack outer container on the packing table with the horizontal

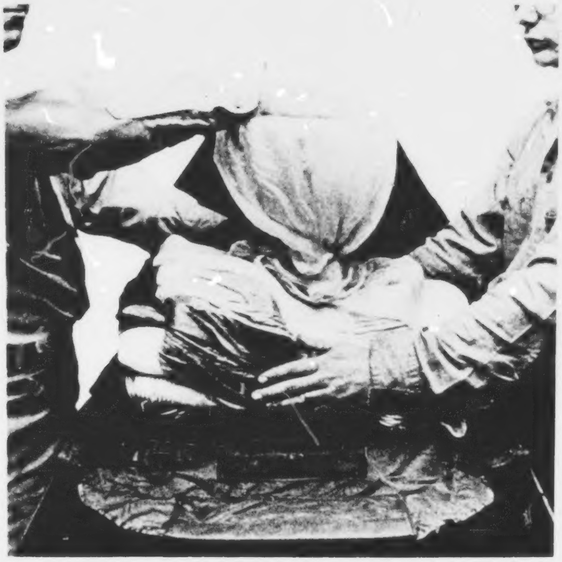


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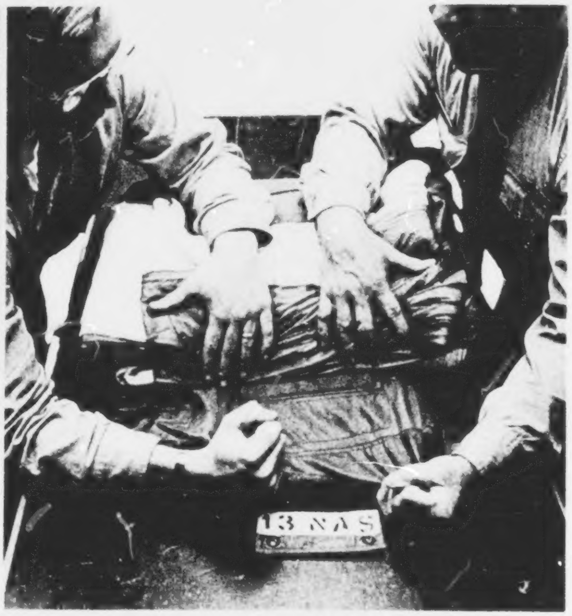
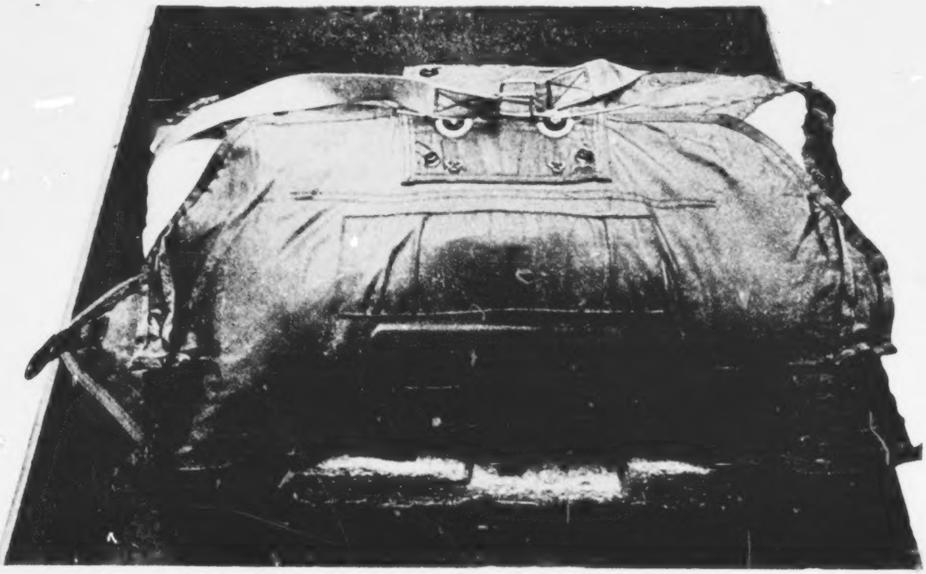
Figure 6-18.—Compressing the pilot parachute.



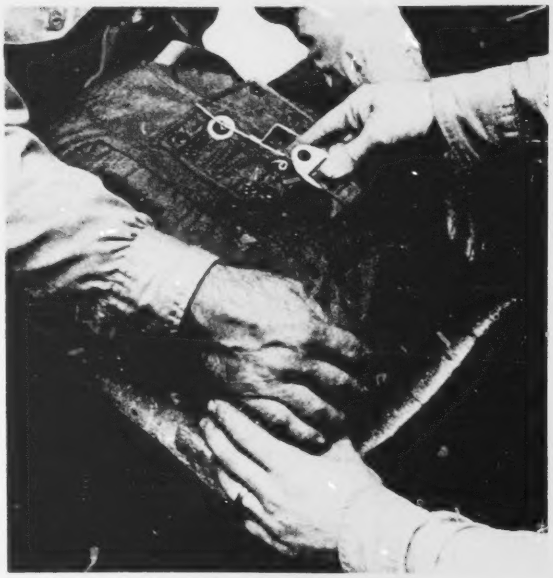
PR.171

Figure 6-19.—Holding the pilot parachute compressed with the forearms.



PR.172

Figure 6-20.—Locking pins installation.



PR.173

Figure 6-21.–Closing the first end flap.

and vertical strap adapters facing up as shown in figure 6-31.

Insert the combination carrying case and equipment container into the outer container with the shoulder straps facing up and the strap handle positioned at the open end of the outer container. (See fig. 6-32.)

Pull the outer container main panels over the sides of the combination carrying case and equipment container and fasten the vertical strap quick disconnect shackle. Reeve the horizontal and vertical straps snugly together as illustrated in figure 6-33.

Mark the horizontal and vertical straps midway between the adapter and end of the strap as shown in figure 6-34.

Remove the combination carrying case and equipment container from the outer container. Fold the horizontal and vertical straps under at the mark made in the previous paragraph. Tuck the strap ends under the adapters. Tack the folded under strap to the strap located beneath it, passing the cord around the adapter. Use one turn of waxed nylon 6-cord, double. Tie the ends with a surgeon's knot followed by a square knot. (See fig. 6-35.)

Place the standard soft pack outer container on top of the parachute, with the outer container adapters facing the parachute container. Tack the four corners of the standard soft pack outer container to the bottom of the parachute container. Tack the outer container main panel on each side of the vertical strap to the parachute container. Pass all tackings around the parachute container wire frame. Tackings must

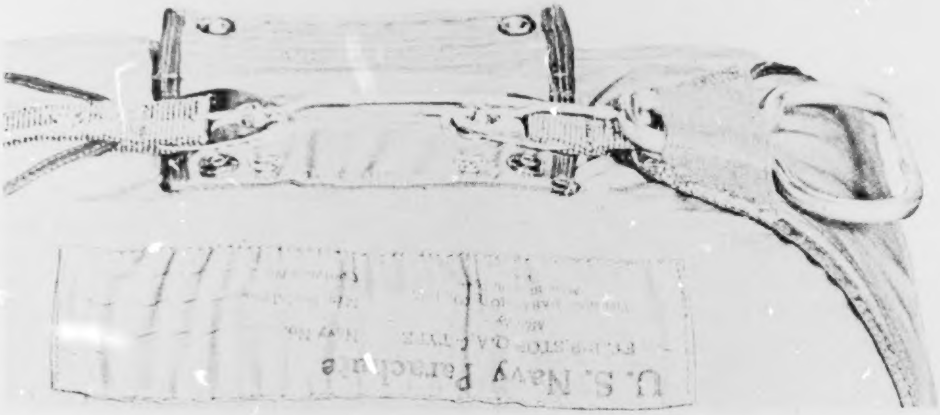


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Figure 6-22.–Temporary locking pins removed and ripcord inserted.

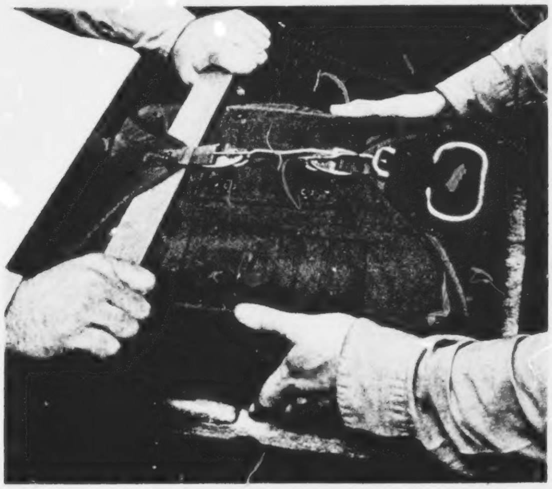

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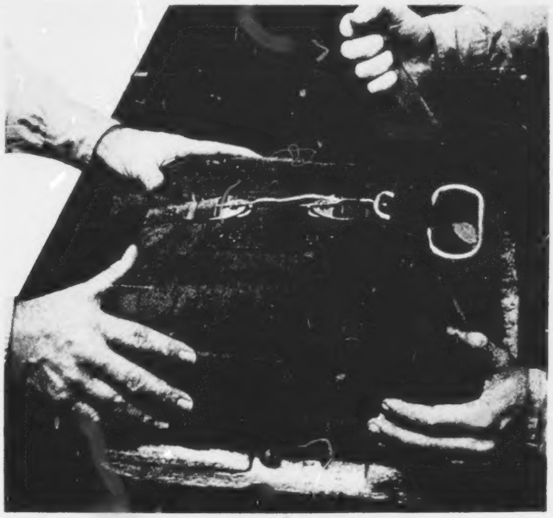
Figure 6-23.—Long bar inserted.



PR.175

Figure 6-24.—Using the packing fid.

be made with two turns of waxed nylon 6-cord, double. Tie the ends with a surgeon's knot followed by a square knot as shown in figure 6-36.

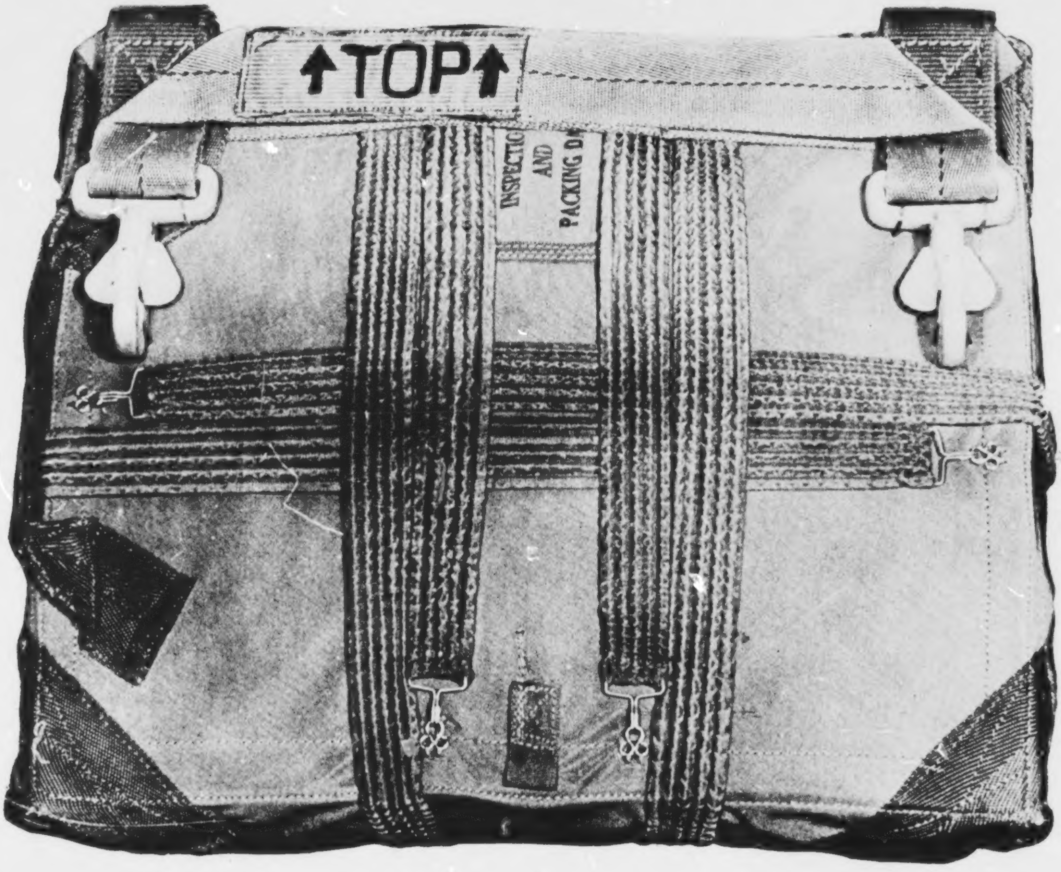
Insert the combination carrying case and equipment container into the standard soft pack outer container. Position the parachute container under the riser assembly with the inside facing the packing table and the ripcord pin protector flap facing the canopy as shown in figure 6-37.

Tie the riser assembly quick-connector snaps to the standard soft pack outer container using the six 10-inch lengths of type III nylon cord. Pass the cord through each side of the slot and around the hook on both quick-disconnect snaps. Tie off the ends with a square knot. Tack one turn of waxed nylon 6-cord, single, through each square knot. Tie the ends with a surgeon's knot followed by a square knot. (See fig. 6-38.)

Rotate the parachute container, from the ripcord pin protector flap side over, so that the standard soft pack faces the packing table. The connector links must be positioned on top of the container with the lift webs through the top side flap slots. Tack both sides of the lift webs to the container, passing one turn of waxed side E nylon thread, single, through the webbing and around the container frame. Tie the ends with a surgeon's knot followed by a square knot as shown in figure 6-39.

Remove the combination carrying case and equipment container from the standard soft pack outer container. Pull the parachute container out from under the connector links so that the inside of the parachute container faces the packing table and the ripcord pin protector flap faces the canopy. Fold the side and end flaps under the container and insert the tension hooks into the connector links and the packing table. The assembly is now ready for packing the parachute canopy as illustrated in figure 6-40.

For more details concerning the NC-3 parachute assembly refer to NavAir 13-1-6.2.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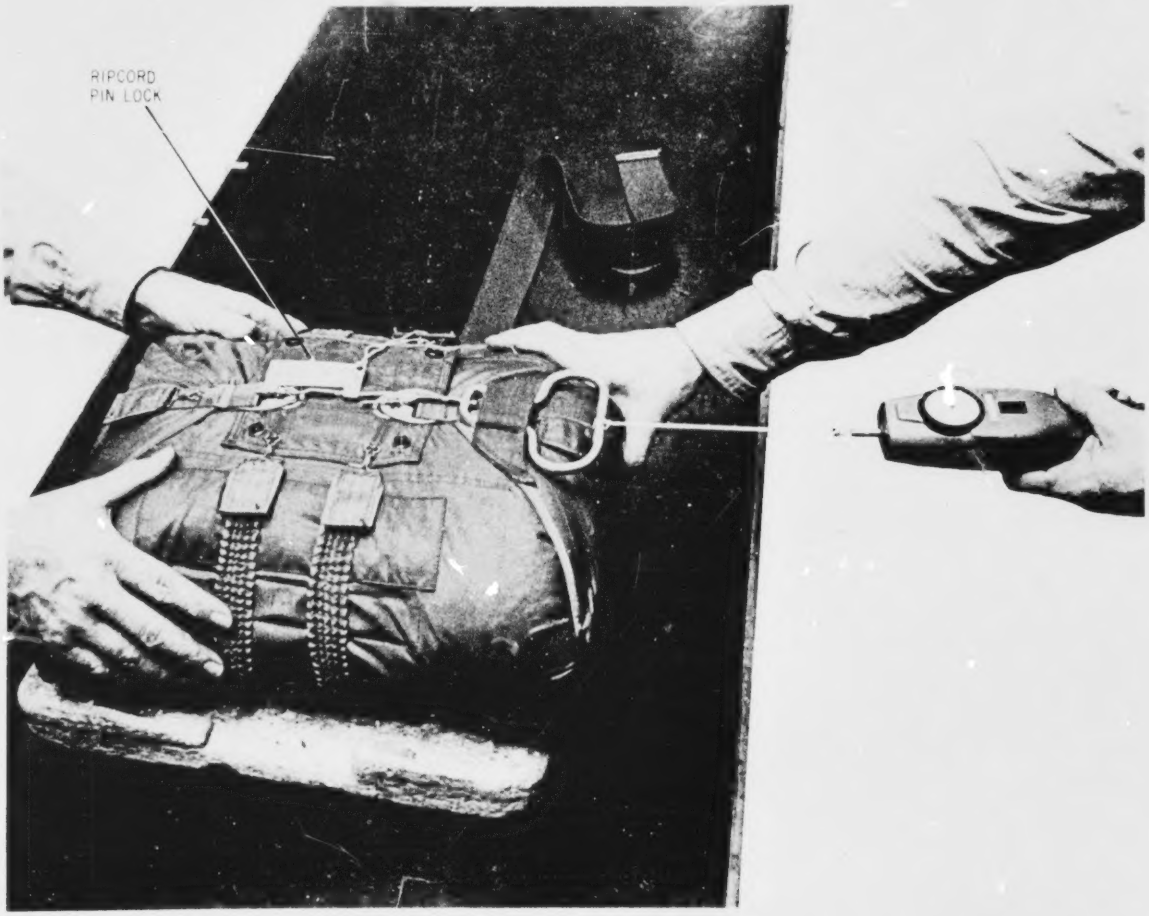
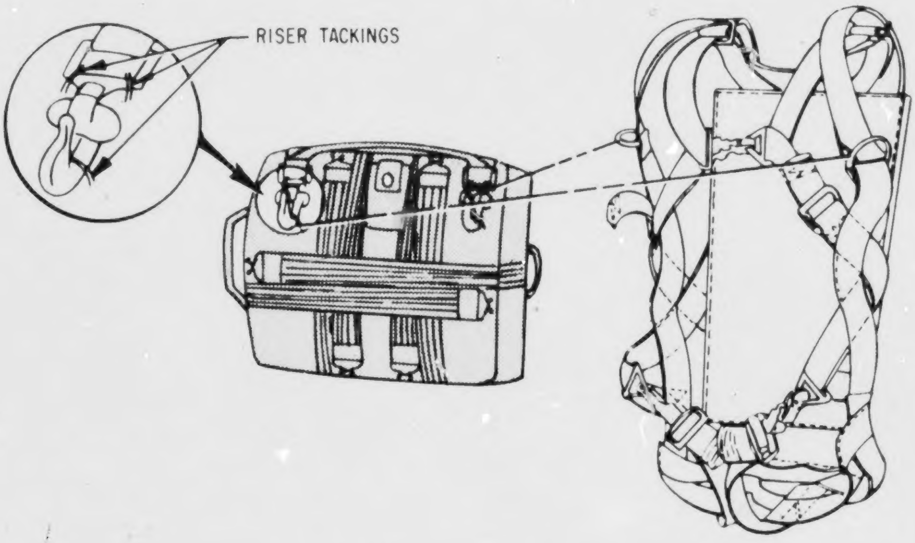
PR.178

Figure 6-25.—Spring opening bands attached to the container. Note that the bands go underneath the cross connector strap and the parachute carrying handle.


RIPCORD
PIN LOCK

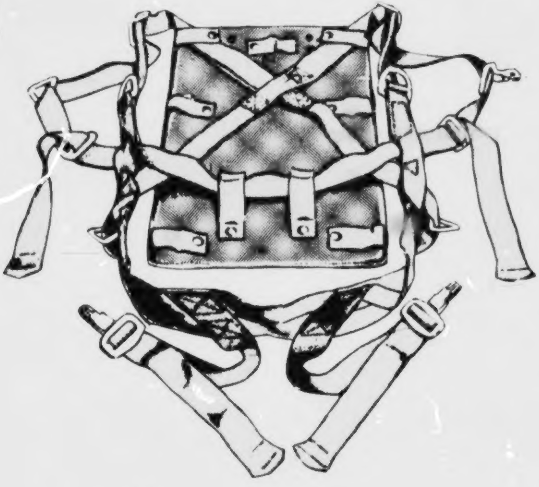
PR.177

Figure 6-26.—Performing the ripcord pin pull test.



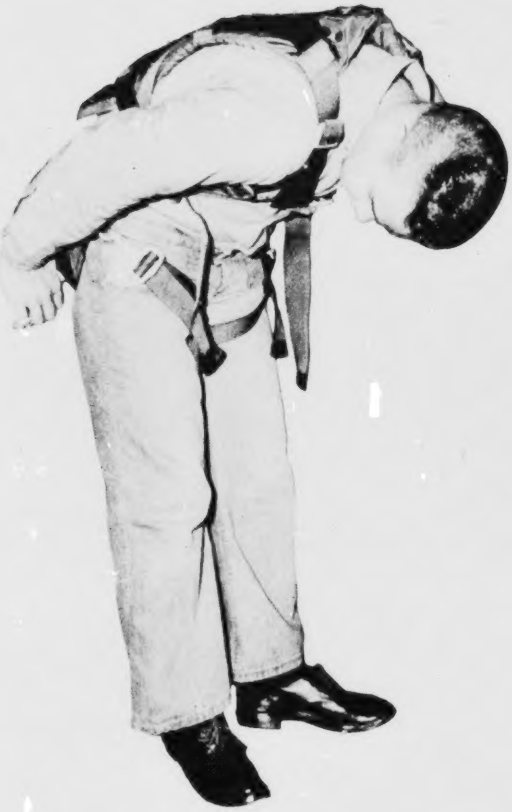
PR.119

Figure 6-27.—Chest harness and NC-3 parachute attachment points.



PR.135

Figure 6-28.—Back pad attachment to the chest harness.



PR.179

Figure 6-29.—Body in position for adjusting the NC-3 harness.

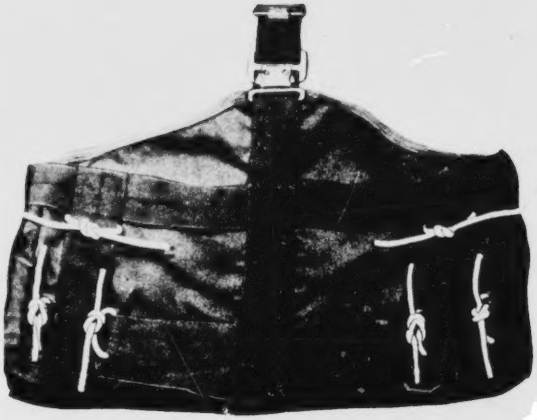


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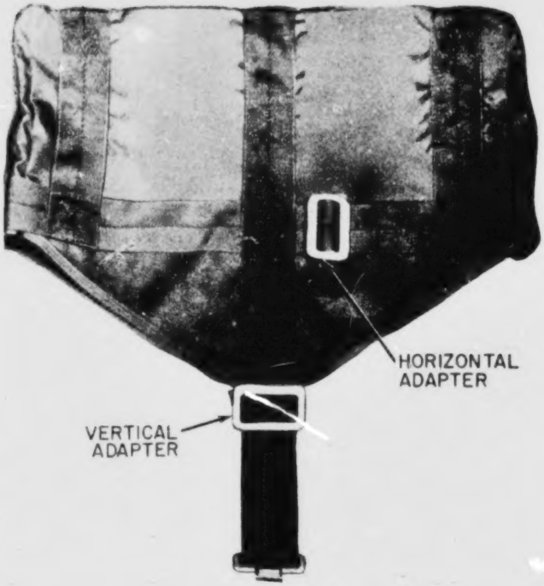
Figure 6-30.—Attachment of the six 10-inch lengths of nylon cord.


HORIZONTAL ADAPTER
VERTICAL ADAPTER

PR.181

Figure 6-31.—Position of the horizontal and vertical strap adapters.

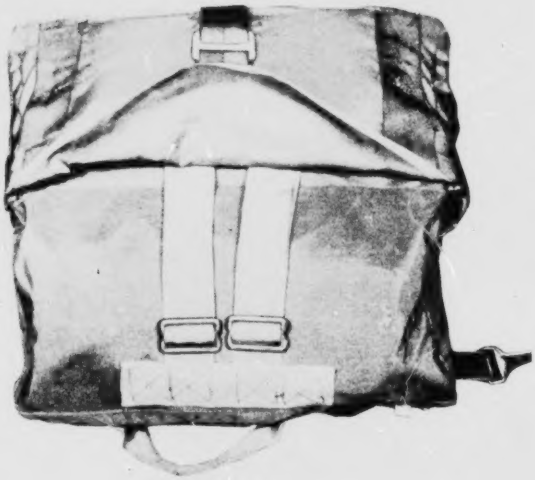


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Figure 6-32.–Position of shoulder strap and strap handle.

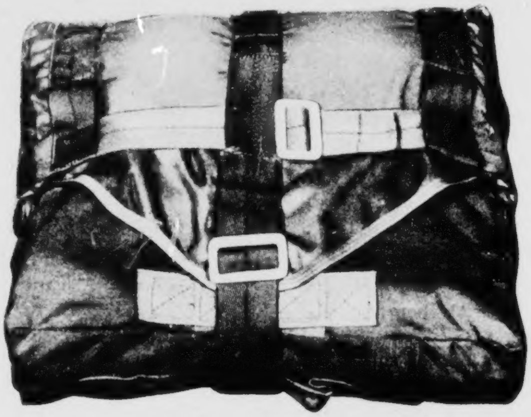

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Figure 6-34.–Marking the horizontal and vertical straps.

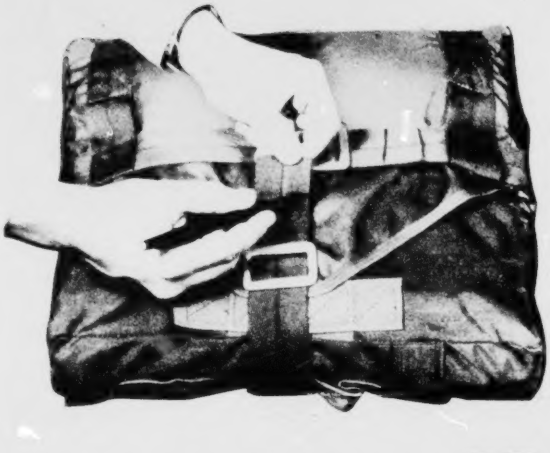

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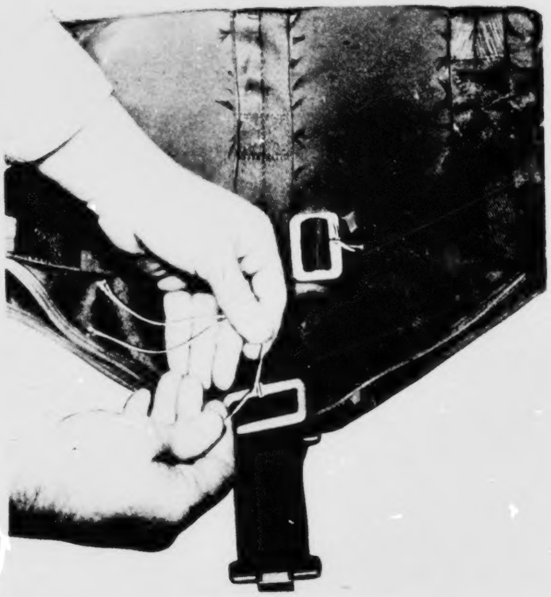
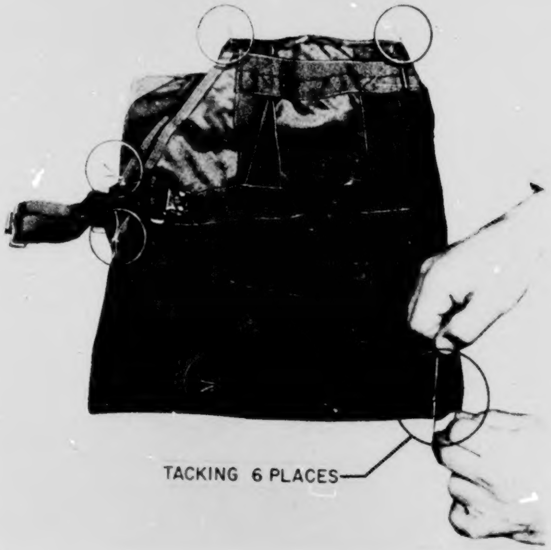
Figure 6-33.–Horizontal and vertical straps reeved.



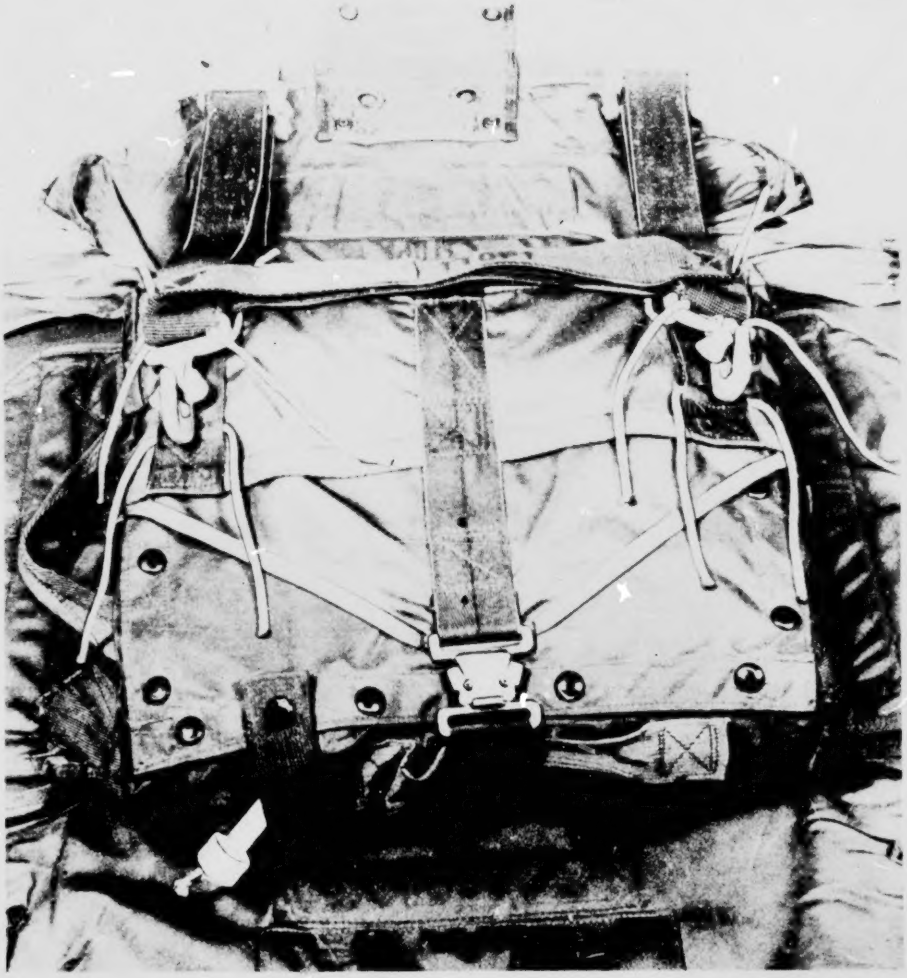
PR.185

Figure 6-35.–Tacking the straps to the adapters.


TACKING 6 PLACES

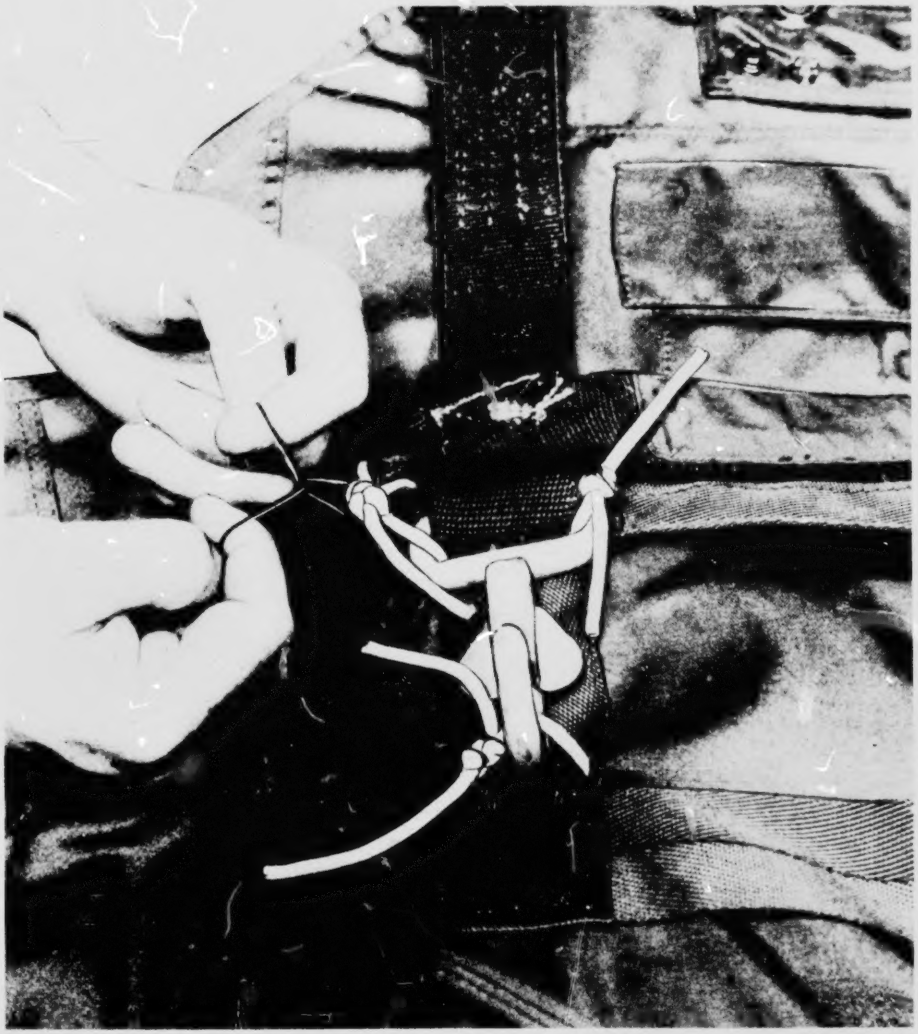
PR.186

Figure 6-36.—Tacking the soft pack outer container to the parachute container.



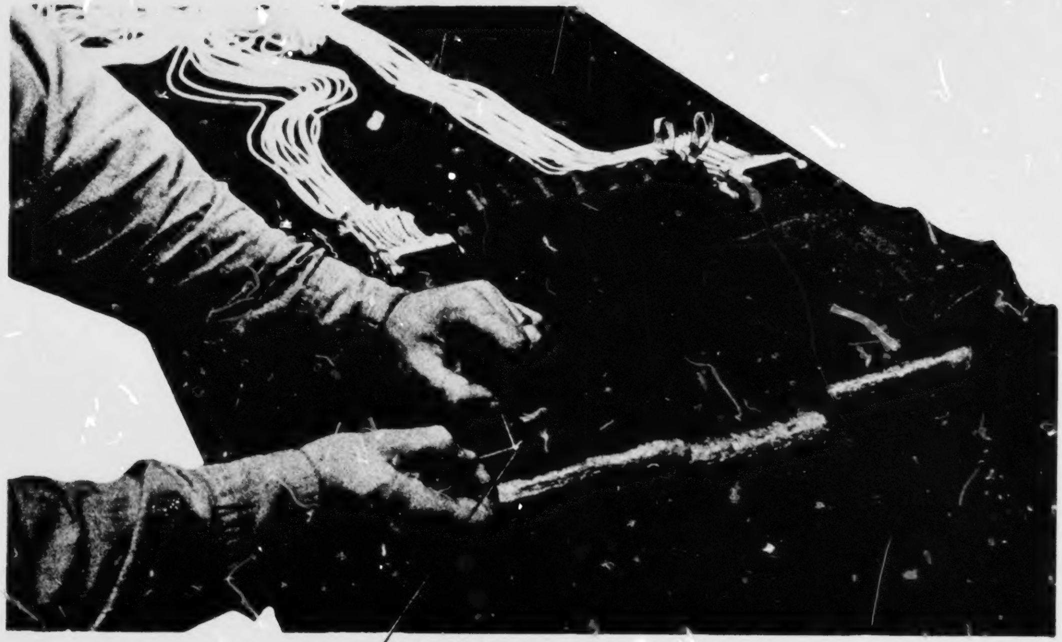
PR.187

Figure 6-37.—Positioning the riser assembly and the two containers.



PR.188

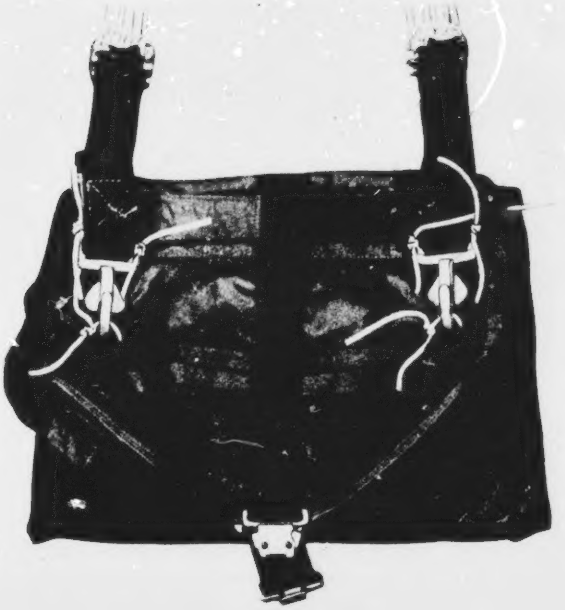
Figure 6-3[illegible].—Tying the riser assembly quick-disconnect snaps to the standard soft pack outer container.



TACKING (4 PLACES)

PR.189

Figure 6-39.–Lift webs tacked to the parachute container.



PR.190

Figure 6-40.—Standard soft pack container attached to the NC-3 assembly.

CHAPTER 7

NB-11 AND NES-16A PERSONNEL PARACHUTE ASSEMBLIES

The NB-11 and NES-16A are back type parachutes used with an integrated torso harness suit as part of the ejection seat escape system.

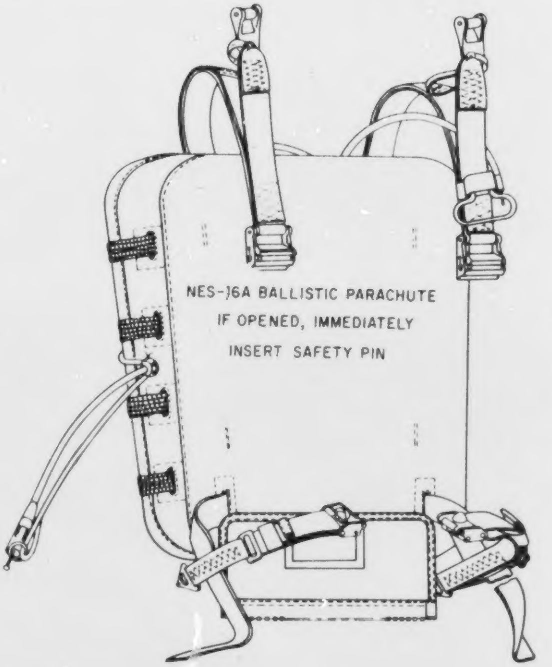
The NB-11 and NES-16A assemblies include modified 28-foot diameter, flat, nylon canopies with 28 gores. A ballistic spreading gun is used to rapidly extend the parachute skirt during the deployment of the canopy. The canopy is packed in a semirigid contoured container. A unique feature of these assemblies is the use of an external parachute stowed in a special elastic pocket on the container flap. The riser assembly, rigged to the container, is connected to the torso harness suit with quick release fittings. The integrated torso harness suit incorporates the aircrewman's parachute harness and provides attachment points for the lap and shoulder restraint systems.

The harness is channeled through the torso suit to retain it in position and to facilitate donning. When aboard the aircraft and seated, the aircrewman connects the quick release fittings on the parachute riser assembly to the quick release shoulder fittings on the integrated torso suit. The rigid seat survival kit (RSSK) is also connected to the integrated torso suit by means of quick release fittings.

The major difference in configuration between the NB-11 and NES-16A is that the NES-16A incorporates the use of a Tri-Mode External Pilot Parachute Assembly. This Tri-Mode assembly improves the main parachute deployment at intermediate speeds. Figure 7-1 shows the NB-11 and NES-16A parachute assemblies.

FUNCTION

After ejection, the following operations take place:



PR.191

Figure 7-1.—NB-11 and NES-16A personnel parachute assembly.

All of the following steps pertain to both assemblies unless otherwise noted at the beginning of each individual step.

1. (NB-11) The external pilot parachute is removed from its pocket and opened at the time of seat separation by the static line attached to the ejection seat. At speeds above 120 knots, the external pilot parachute separates from the container by release of a shear link assembly; only the internal pilot parachute withdraws the

canopy. At speeds below 120 knots, the external pilot parachute will be retained.

2. (NES-16A) The external pilot parachute is removed from its pocket and opened at the time of seat separation by the static line attached to the ejection seat. At speeds from 0 to 90 knots, the external pilot parachute will inflate to full diameter. At speeds between 90 and 250 knots, the diameter will reduce to 24 inches and at speeds in excess of 250 knots, the external pilot chute (EPC) will reduce to flag drag but the effective drag will still be sufficient to extract the internal pilot parachute and the main canopy.

3. At a preset altitude, the automatic parachute actuator fires. The ripcord pins are pulled from the locking cones allowing the spring opening bands to open the container. The pilot parachute springs from the container and fills with air during this operation. The external pilot parachute release assembly releases the shear link cable when the container opens.

4. The aircrewman, falling away from the external pilot parachute (if still attached) and the internal pilot parachute, causes the main canopy to be pulled from the container, followed by the suspension lines. The canopy begins to fill with air during this operation. The connector link ties break as the load is applied allowing the risers to be pulled from the container. The external pilot parachute is used to effect more rapid opening of the parachute, especially at low altitude or ground level ejection.

5. Just prior to full suspension line stretch, the spreading gun fires, forcing the suspension lines outward at the skirt hem. This aids in rapid opening of the canopy by allowing it to fill quickly with air.

NOTE: If the spreading gun fails to fire, the slugs will separate from the gun assembly at full suspension line stretch allowing the canopy to open fully.

6. The aircrewman hangs suspended in his harness from the quick release shoulder fittings during descent. Upon landing, the canopy and suspension lines can be disengaged from the integrated torso suit by using the quick release shoulder fittings.

7. If the aircrewman should have to bail out without using the ejection seat, only the internal pilot parachute will deploy the main canopy and will disconnect from the external pilot chute bridle by means of the external pilot parachute override disconnect assembly.

The NB-11 and NES-16A personnel parachute assemblies should be updated by comparing the configuration of the assembly with the modifications listed in NavAir 13-1-6.2. The following update requirement is very important as it concerns an item of safety.

Using black wash proof ink, stencil on the back (comfort pad) side of the parachute container, in 2-inch high letters, "NB-11 BALLISTIC PARACHUTE–IF OPENED IMMEDIATELY INSERT SAFETY PIN."

RIGGING AND PACKING

Collateral duty inspection (CDI) points are included in the applicable Shop Process Cards pertaining to rigging and packing procedures for the NB-11 and NES-16A. The Shop Process Cards are arranged in a logical sequence to aid the Aircrew Survival Equipmentman. When an inspection step is underlined in NavAir 13-1-6.2, and/or mandatory inspection points are denoted in the Shop Process Card deck, all work concerning the rigging and packing procedures must stop until the collateral duty inspector has performed the requirements listed.

WARNING: Use extreme caution when rigging and packing the NB-11 and/or NES-16A parachute as these assemblies incorporate a ballistic spreading gun.

During the rigging and packing procedures, the packer must be positioned on the left side of the table and the helper on the right when facing the canopy from the riser/harness end of the packing table.

When the NB-11 and/or NES-16A parachute assemblies require repacking, maintenance, modification, or repair the work should be accomplished at the lowest level of maintenance equipped to satisfactorily perform the work. Mission, time, equipment, trained personnel, and operational needs are the basic considerations involved in determining which maintenance level will be used.

PRELIMINARY PROCEDURES CALENDAR/ SPECIAL INSPECTION ONLY

Lay out the required packing tools on the packing table and check them for nicks, burrs or sharp edges which could cause damage to the parachute assembly. Count and record the number of packing tools.

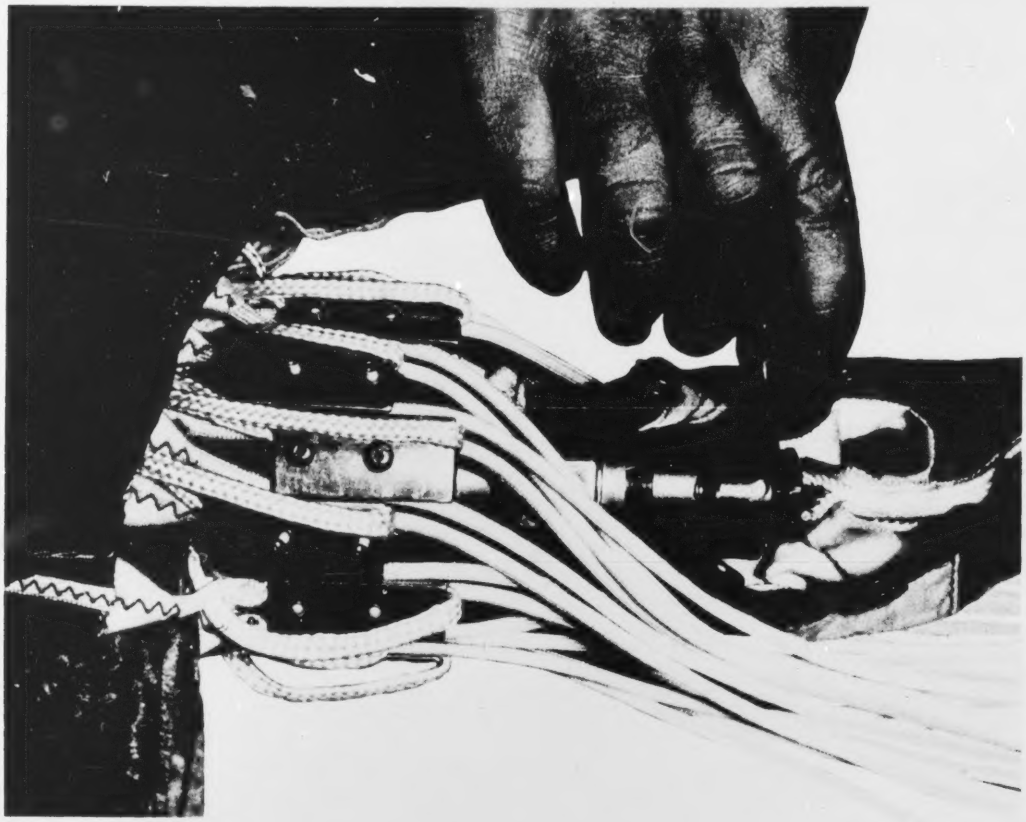
Open the parachute assembly, insuring that the external pilot parachute release assembly releases the swaged ball on the external pilot parachute release cable.

If the release assembly fails to release the swaged ball, replace the release assembly.

NOTE: Do not remove the folded canopy or suspension lines from the container.

Carefully raise the folded canopy at the top end of the container, exposing the spreading gun. Open the fasteners on the extractor sleeve and fully insert safety pin into the spreading gun. The safety pin button must be pressed to insert the pin as shown in figure 7-2.

Untie, remove, and retain the 36-inch length of nylon tape securing the canopy peak in position on top of the folded canopy. Remove only the folded canopy from the container. Remove the lower spreading gun firing lanyard from the outboard connector link on the right side of the packing table. Also remove the lower spreading gun firing lanyard from the retaining bands, and then remove the connector link ties. Remove the external pilot parachute from the elastic stow pocket on the container side flap. Insure

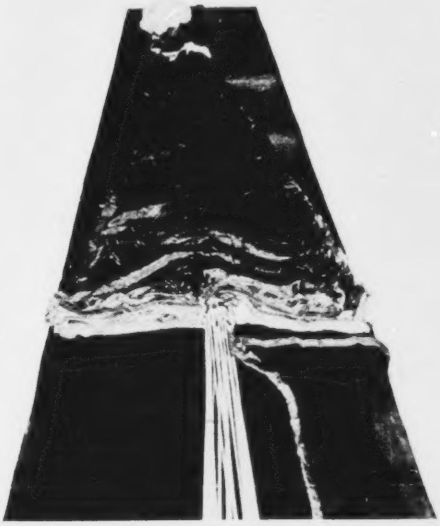


PR.192

Figure 7-2.—Inserting the safety pin into the spreading gun.

that the firing lanyard is not attached to the connector link.

Lay out the canopy and the pilot parachute full length on a packing table as shown in figure 7-3. Rotate the spreading gun so that suspension lines 1 and 28 are facing up. Separate the folded gores into two groups, counting 14 gores on each side of the spreading gun. Connect the two groups of connector links to their respective tension hooks on the packing table, and complete the parachute assembly inspection in accordance with chapter 2 of this manual.



PR.193

Figure 7-3.—Canopy laid out on packing table.

NOTE: Insure the knurled portions of the connector link yoke and plate assemblies face up and the screw heads face outboard.

PRELIMINARY PROCEDURES ORIGINAL ISSUE ONLY

Insure that the complete parachute assembly has been inspected in accordance with the information contained in NavAir 13-1-6.2.

Lay out and inspect the packing tools, recording the number of tools being used.

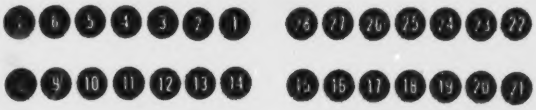
Lay out the canopy and pilot parachute full length on a clean packing table. Find the canopy gore with the nameplate and place it uppermost in the center of the table. Separate the suspension lines into two equal groups, counting 14 lines on each side of the nameplate gore. Place the connector link holding suspension lines 1 through 7 on top of the connector link holding lines 8 through 14. Place the connector link holding suspension lines 22 through 28 on top of the connector link holding lines 15 through 21. Connect these two groups of connector links to their respective tension hooks on the packing table.

On the NB-11, attach the pilot parachute using a bowline knot. On the NES-16A, attach the pilot parachute by forming a lark's head knot around the vent lines. Attach the tension strap to the canopy at the vent lines and apply the desired tension.

SUSPENSION LINE CONTINUITY CHECK WITHOUT THE SPREADING GUN INSTALLED

The suspension lines are arranged on the connector links as shown in figure 7-4 when viewed from the connector link end of the packing table. They should run free from the connector links to the skirt hem without dips or twists. If there are dips or twists, they must be removed using the procedures discussed in chapter 5 of this manual.

To check the suspension line continuity, the packer starts with line number 1 on the left side of the nameplate gore and works through line number 14. The helper is positioned at the



PR.194

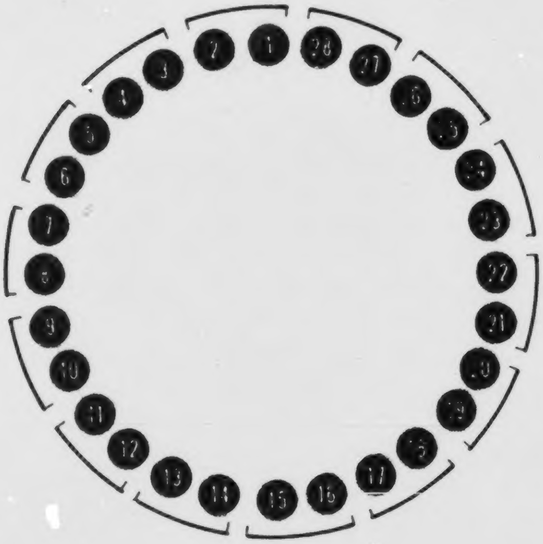
Figure 7-4.—Arrangement of suspension lines on connector links and skirt hem.

connector links to check the suspension lines selected by the packer for continuity, dips, and twists. Suspension line continuity on the right side of the nameplate gore is checked in the same manner except the packer starts with line 28 and works through line number 15.

SUSPENSION LINE CONTINUITY CHECK WITH SPREADING GUN INSTALLED

On the NB-11, attach the tension strap hook to the loop in the pilot parachute connector cord and tighten. On the NES-16A, attach the tension strap hook around the canopy vent lines and tighten.

Suspension lines must be arranged on the connector links in accordance with figure 7-4 and on the spreading gun in accordance with figure 7-5. The spreading gun must be so positioned that suspension lines 1 and 28 face up.



PR.195

Figure 7-5.—Arrangement of suspension lines on the spreading gun.

The suspension lines should pass through the corresponding numbered slots in the spreading gun slugs. Insure that the loops attached to odd-numbered suspension lines pass through slots in the odd-numbered slugs.

Suspension lines must run free of the skirt hem through the corresponding numbered slots in the spreading gun slugs to the connector links without dips or twists.

ATTACHMENT OF SUSPENSION LINE CONNECTOR LINKS TO THE RISER ASSEMBLY, ORIGINAL ISSUE ONLY

Lay out the risers and cross connector straps on the packing table behind the connector links. The riser fasteners should face the packing table. Remove the connector links from the tension hooks. Remove the tension hook from the packing table.

Remove the connector link yoke and plate assembly from each connector link. Insert bottom connector links into the loop at each end of a cross connector strap. Insert the bottom connector links in the bottom lift webs. Reattach the yoke and plate assemblies to the bottom connector links and tighten the screws to a torque value of 20 to 25 pound-inches. Apply a tamper dot to the connector link screwheads using insignia red colored lacquer. Do not apply a tamper dot to the top right connector link at this time.

Attach the top lift webs and cross connector strap to the top connector links in the same manner as just described. Insert the tension hooks into the connector links and into the holes in the packing table. Perform a continuity check of the suspension lines.

WHIPPING AND FOLDING THE CANOPY GORES WITHOUT THE SPREADING GUN INSTALLED

To whip and fold the canopy gores, tighten the tension strap at the canopy peak. Pull the canopy vent collar below the vent hem and straighten the hem if necessary. Pull the vent collar back to its original position. Tie a shot bag to a 20-foot length of type III nylon cord. The packer and helper lifts up the top gore so that the canopy peak is visible. The packer now throws the shot bag attached to the line under the raised gore so that it reaches the canopy peak.

Pull the shot bag through the vent hem and tie the line temporarily to the vent lines. Place the nylon line in the center of the canopy and secure the bottom end to keep it from being pulled into the canopy during the whipping and folding operation.

Both men must now lift the suspension lines on each side of the nameplate gore up and out. The skirt hem between the lines should be taut so that the canopy peak can be seen on the inside. While holding the suspension lines up, each man must whip that gore hanging from the line outward. Draw the next suspension line upward to the line held in the hand, using a rapid circular motion. Continue the whipping operation for all of the gores. Insure that the radial seams are not overlapped by the gore material. Move the whipped gores rapidly back and forth across the packing table.

The two groups of suspension lines must be stretched to the edges of the packing table with the gores hanging over the table sides. The packer and helper should flap the handing gores up and down rapidly, in a whipping motion, to eliminate wrinkles, while holding the suspension line groups at the edges of the packing table. While the packer flaps the top gore up and down at the skirt hem center, the helper must hold the bottom gore at the skirt hem center.

On signal, both men must draw their respective gores at the skirt hem centers toward the table edge while at the same time bringing the suspension lines to the center of the packing table. Insert the suspension line groups into their respective slots in the suspension line separator and hold the lines down with a shot bag. The packer places a second shot bag across the skirt hem on the left side of the suspension lines.

All gores, except the bottom gore, are rotated by the helper, from the right over to the left side of the packing table. The bottom gore is straightened and smoothed by the helper on the right side of the table throughout its length to the peak. The packer returns the folded gores above the shot bag to the right side of the packing table and the helper straightens and smooths the top gore and places a shot bag on the skirt hem.

All gores, except the bottom one, are rotated by the packer from the left over to the right side of the table. The bottom gore on the left side of the packing table is straightened and smoothed throughout its length to the peak by the packer. Folded gores above the shot bag are returned to the left side of the packing table by the helper while the packer straightens and smooths the top gore. Both men must grasp the skirt hem at midsections of the gores and rotate them toward the suspension lines. Each fold is alined and counted when placed back onto the table. The skirt hem is made uniform and neat by having all of the V-tab reinforcements alined in the same direction on top of each other. Each group of folds on the left and right of the suspension lines must contain 14 gores.

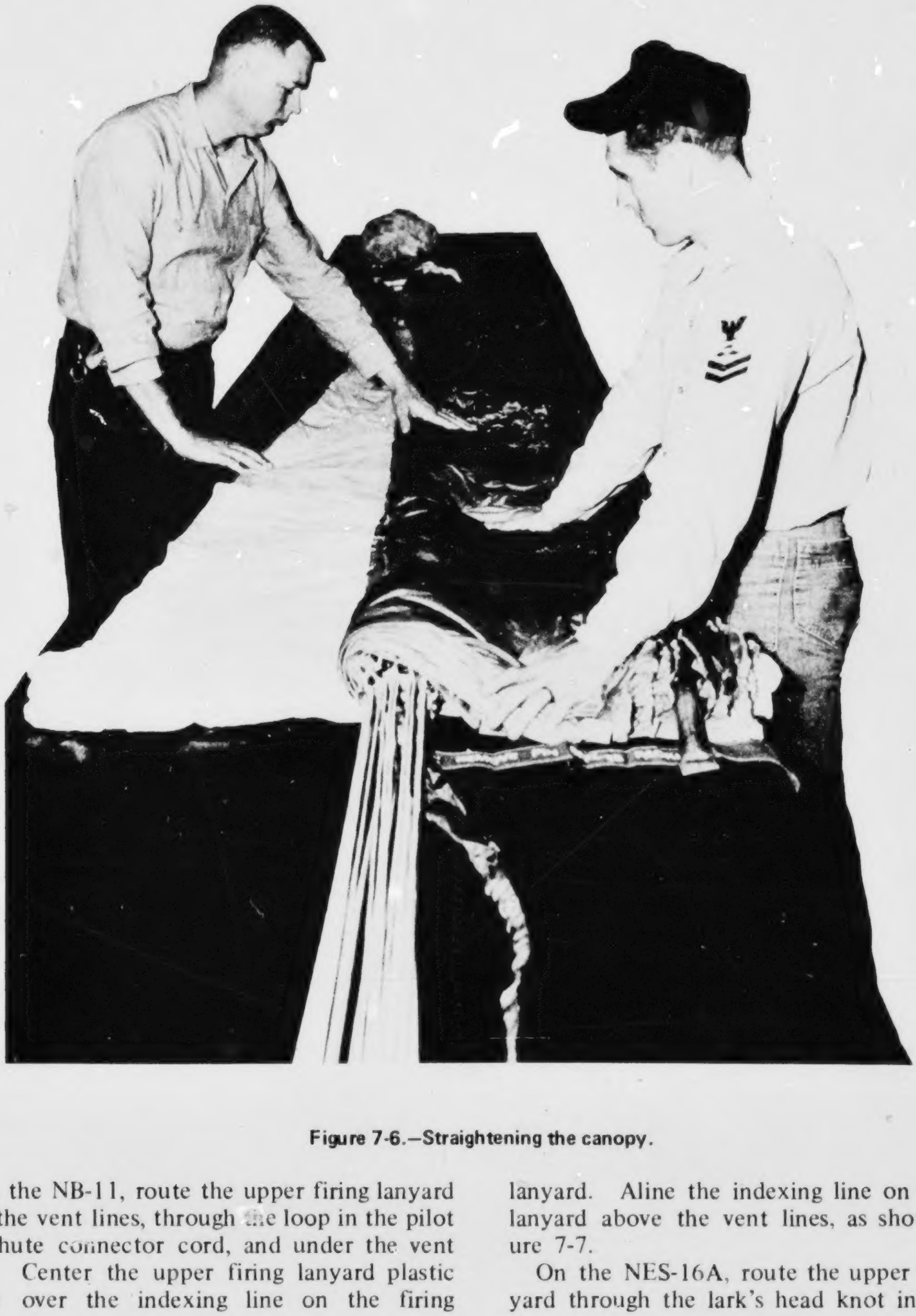
STRAIGHTENING CANOPY GORES WITH SPREADING GUN INSTALLED

Insure that the safety pin is installed in the spreading gun and that the spreading gun firing lanyard is detached from the connector link.

Place a shot bag on the right side of the skirt hem. The packer must fold all the gores on the left side as a group, except the bottom gore, over the right side of the packing table. The packer then straightens and smooths the bottom gore, on the left side of the table, throughout its length to the peak. The packer returns the gores above the shot bag on the right side of the packing table to the left side one at a time and straightens and smooths each gore. The folded gores on the helper's side of the table must be straightened and smoothed in the same manner. This procedure is shown in figure 7-6.

INSTALLATION OF SPREADING GUN, ORIGINAL ISSUE ONLY

Insure that the spreading gun has the safety pin installed. Position the spreading gun between suspension line groups 1 through 14 and 15 through 28 on a whipped and folded canopy so that the upper firing lanyard faces the canopy. Remove the tension strap from the canopy peak. With the use of type III nylon line attached to the upper firing lanyard, pull the upper firing lanyard through the canopy and out the peak. Untie the type III nylon line from the upper firing lanyard.

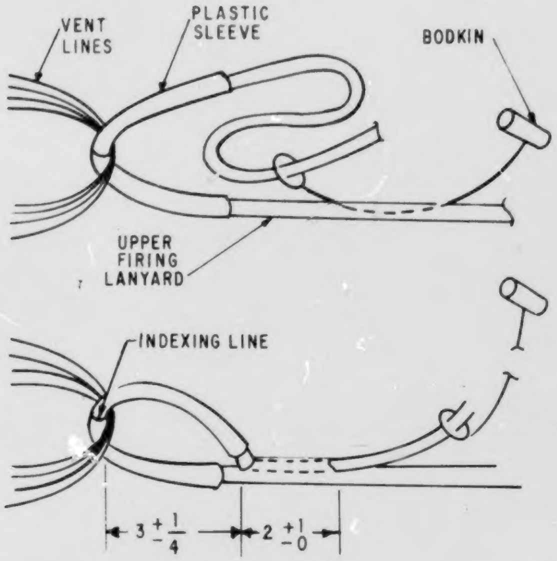


PR.196

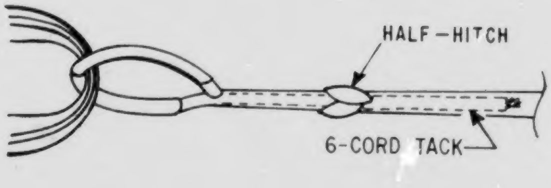
Figure 7-6.—Straightening the canopy.

On the NB-11, route the upper firing lanyard over the vent lines, through the loop in the pilot parachute connector cord, and under the vent lines. Center the upper firing lanyard plastic sleeve over the indexing line on the firing lanyard. Aline the indexing line on the firing lanyard above the vent lines, as shown in figure 7-7.

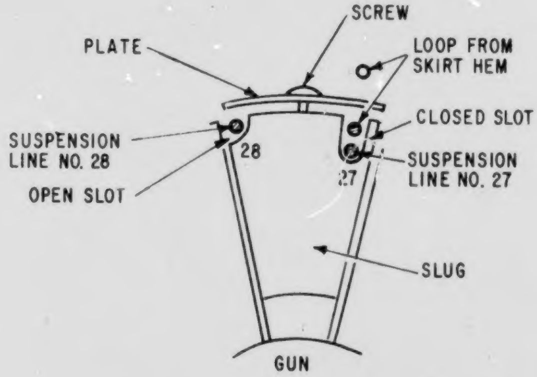
On the NES-16A, route the upper firing lanyard through the lark's head knot in the pilot


VENT LINES
PLASTIC SLEEVE
BODKIN
UPPER FIRING LANYARD
INDEXING LINE
3 ± 1/4
2 +1 −0

PR.197
Figure 7-7.—Routing the upper firing lanyard.


HALF-HITCH
6-CORD TACK

PR.198
Figure 7-8.—Firing lanyard half-hitch and 6-cord tacking.


SCREW
PLATE
LOOP FROM SKIRT HEM
CLOSED SLOT
SUSPENSION LINE NO. 28
28
27
SUSPENSION LINE NO. 27
OPEN SLOT
SLUG
GUN

PR.199
Figure 7-9.—Application of suspension line into slug.

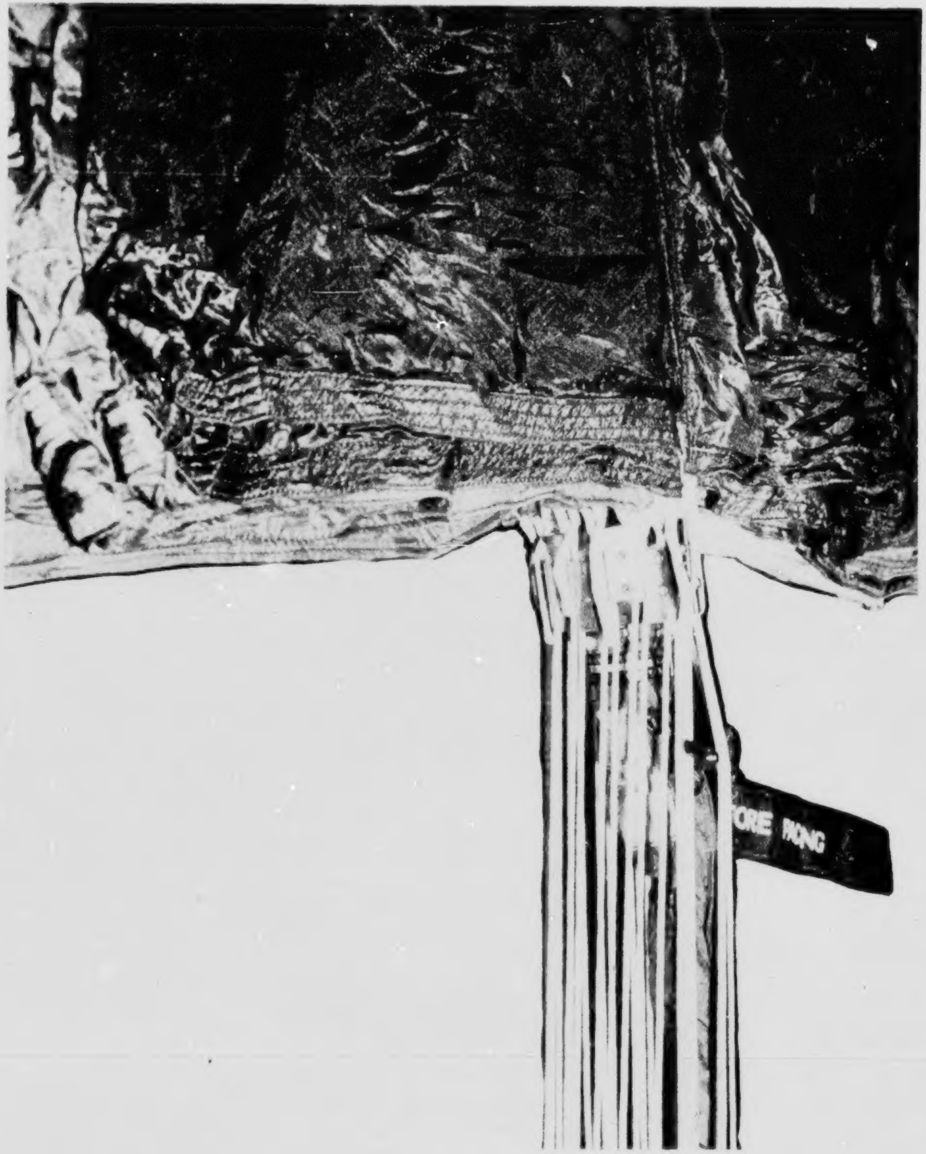
parachute bridle assembly and around all the vent lines. Center the upper firing lanyard plastic sleeve over the indexing line on the firing lanyard. Aline the indexing line on the firing lanyard above the vent lines.

Telescope 2 inches of the firing lanyard into itself, forming a 3-inch (±1/4 inch) loop around the vent lines and connector cord, using a bodkin, as shown in figure 7-7. Tie a half-hitch around the firing lanyard and telescope the remainder of the end into the firing lanyard. (See fig. 7-8.)

Tack the end inside the firing lanyard with two turns of waxed nylon 6-cord, single. Tie the ends with a surgeon's knot followed by a square knot.

Aline the top of the spreading gun with the skirt hem and rotate the gun so that the slug labeled "28-27" is facing up. Loosen the screws and plate on "28-27" and place suspension line number 27 and a single length of the attached loop in the closed slot of the slug. Place suspension line 28 in the open slot of the same slug. The numbers on the slugs correspond to the suspension line numbers and loops to be secured in the slug, as shown in figure 7-9.

Pass the loop around the plate and over the suspension line in the slug. Secure the plate to the slug with the screws provided and insure the suspension lines move freely in the slots. Torque the plate screws to 6 (plus or minus 1/2) pound-inches and apply a tamper dot. Secure the remainder of the suspension lines and loops to the corresponding slugs in the same manner as above. Work from suspension line 26 through 15 and from line 1 through 14. After all the suspension lines are secured, straighten the canopy. Figure 7-10 shows a spreading gun installed.



PR.200

Figure 7-10.—Spreading gun installed.

REMOVAL AND INSTALLATION OF SPREADING GUN IF REQUIRED

To remove a damaged or defective spreading gun and install a new spreading gun, proceed as follows:

NOTE: Insure that the safety pin is installed in the spreading gun.

1. Loosen all screws holding the plates to the spreading gun slugs a sufficient amount to allow the suspension lines to be removed.
2. Slip all suspension lines and attached loops free of the plates.
3. Disconnect the upper firing lanyard from the vent lines.
4. Tie one end of a temporary 20-foot line to the vent lines. Tie the remaining end of the 20-foot line to the free end of the upper firing lanyard.
5. Pull the upper firing lanyard out of the parachute canopy from the skirt end.
6. Untie the temporary 20-foot line from the upper firing lanyard. Remove the damaged or defective spreading gun from the table.
7. Position a new spreading gun on the table and tie a temporary 20-foot line to the free end of a new upper firing lanyard.
8. Pull the new upper firing lanyard through the canopy and out the vent using the 20-foot line. Remove the 20-foot line from the vent lines and firing lanyard.

Install the new spreading gun in accordance with the procedures discussed earlier in this chapter.

STOWAGE OF LOWER FIRING LANYARD IN EXTRACTOR SLEEVE

NOTE: Do not remove the spreading gun safety pin at any time during this procedure.

Open the extractor sleeve fasteners on each side of the spreading gun safety pin. Release the fastener holding the stowage sleeve to the extractor sleeve and remove the stowage sleeve from the extractor sleeve. Inspect the lower firing lanyard for proper stowage; if found to be improperly stowed, remove the firing lanyard from the stowage sleeve and proceed as in the following paragraphs.

Cut a 30-inch length of type I nylon cord. Starting 9 inches from the sewn loop at the top, form a bight twice the length of the stowage sleeve in the lower firing lanyard. Route the type I nylon cord through the bight of the firing lanyard and draw the type I line through the stowage sleeve channel, using a bodkin. Draw the firing lanyard through the stowage channel to the bottom using the type I nylon line.

Slowly remove the type I nylon line from the firing lanyard bight. Use extreme caution when removing the type I nylon line as rapid removal could cause damage to the firing lanyard.

Form and stow a 9-inch bight of firing lanyard in the remaining stowage sleeve channel in the same manner. Tack the second lanyard bight to the stowage sleeve with one turn of waxed size A nylon thread, single.

Tie the ends with a surgeon's knot followed by a square knot. Insure that the firing lanyard is not twisted around the 1/2-inch tape. Insert the stowage sleeve into the extractor sleeve, open end first.

Engage the fastener on the stowage sleeve to the fastener on the extractor sleeve. Engage the extractor sleeve fasteners on each side of the safety pin. (See fig. 7-11.)

ATTACHMENT OF THE EXTERNAL PILOT PARACHUTE (NB-11)

Insert the spring and sear attached to the external pilot parachute bridle into the wide end

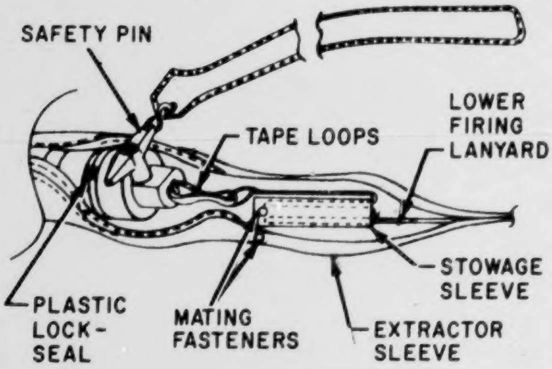
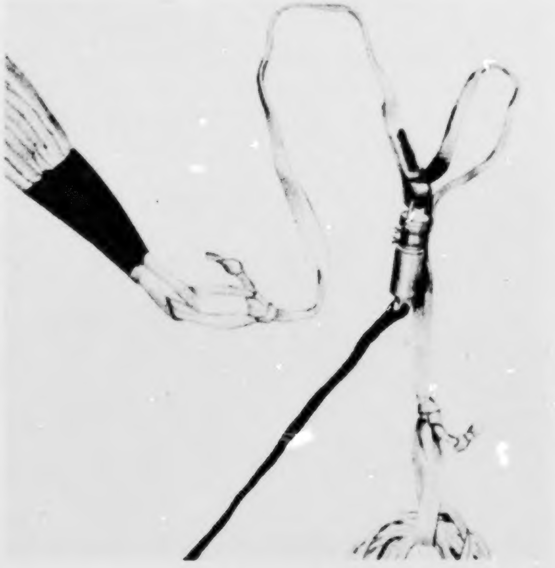


Figure 7-11.—Arrangement of fasteners on the stowage sleeve and the extractor sleeve.

of the override disconnect barrel. Push the sear into the barrel, using a temporary locking pin, until the sear protrudes from the opposite end. Engage the sear on the internal pilot parachute connector cord with the spring and sear in the barrel and release the tension on the spring and sear. Attachment of the external pilot parachute is shown in figure 7-12.



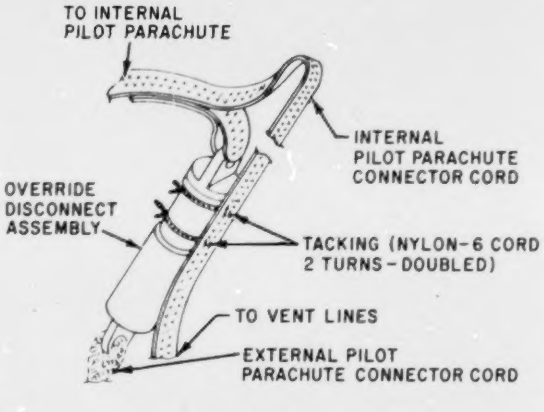
PR.202

Figure 7-12.–Attachment of the external pilot parachute.

Tack the override disconnect to the internal pilot parachute bridle 3 inches above the knot, securing the bridle to the vent line at two places. Use two turns of waxed nylon 6-cord, double, for each tacking. Tie the ends with a surgeon's knot followed by a square knot. (See fig. 7-13.)

ATTACHMENT OF THE EXTERNAL PILOT PARACHUTE (NES-16A)

To attach the external pilot parachute on the NES-16A parachute assembly, use the same procedure as was discussed in the previous section, except for the following:


TO INTERNAL PILOT PARACHUTE
INTERNAL PILOT PARACHUTE CONNECTOR CORD
OVERRIDE DISCONNECT ASSEMBLY
TACKING (NYLON-6 CORD 2 TURNS-DOUBLED)
TO VENT LINES
EXTERNAL PILOT PARACHUTE CONNECTOR CORD

PR.203

Figure 7-13.–Tacking the override disconnect to the external pilot parachute bridle NB-11.

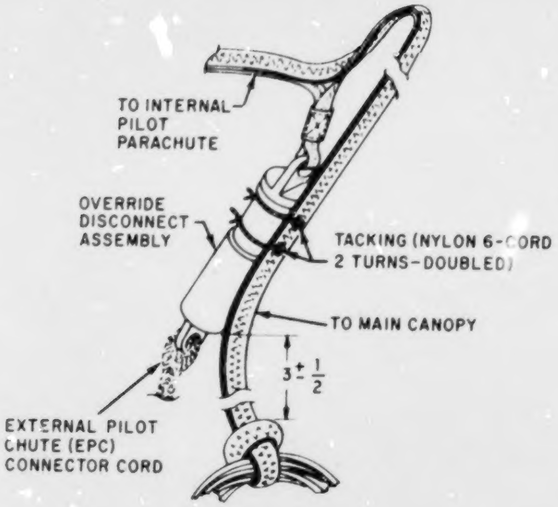
Tack the override disconnect to the internal pilot parachute connector cord, 3 inches (±1/2 inch) above the knot securing the connector cord to the vent lines, at two places. Use two turns of waxed nylon 6-cord, double, for each tacking. Tie the ends with a surgeon's knot followed by a square knot. (See fig. 7-14.)

INSTALLATION OF THE AUTOMATIC ACTUATOR

Only automatic actuators set to fire at 14,000 (±500) feet are used in these parachute assemblies. To install the actuator, rotate the risers over the suspension lines and position the container on the packing table so that the bottom end is toward the canopy and the inside faces up. Attach and crimp one end of both short container spring opening bands to the container eyes with the hooks facing down.

New retaining bands are used each time these assemblies are repacked. Install the new retaining bands (using a lark's head knot) on the four inboard retaining band loops located on the helper's side of the packing table and on the four inboard retaining band loops located on the packer's side of the table.

Insert the power cable through the buttonhole in the top end of the container. Route the end of the arming cable housing through the


TO INTERNAL PILOT PARACHUTE
OVERRIDE DISCONNECT ASSEMBLY
TACKING (NYLON 6-CORD 2 TURNS–DOUBLED)
TO MAIN CANOPY
3 ± 1/2
EXTERNAL PILOT CHUTE (EPC) CONNECTOR CORD

PR.204

Figure 7-14.—NES-16A, tacking the override disconnect to the internal pilot parachute bridle.

housing port located in the right side of the actuator pocket and through the buttonhole located on the right side of the container.

Inspect, arm, and assemble the automatic actuator in accordance with NavAir 13-1-6.2. Record the actuator time delay, installation date, and cartridge expiration date on the Parachute History Card.

NOTE: The automatic actuator must be armed with a Mk 4 Mod 0, 0.75-second time delay cartridge or a Mk 4 Mod 1, 0.75-second time delay cartridge.

Install the actuator into the actuator pocket and close the slide fastener. Snap the actuator pocket flap closed.

Collateral duty inspectors must now check the installation of the automatic actuator and the position of the cables.

ATTACHMENT OF THE CONTAINER ASSEMBLY TO THE RISER ASSEMBLY

Remove the tension strap from the canopy peak and remove the tension hooks from the connector links and packing table. Rotate the risers onto the container and secure the riser fasteners to the four bottom container fasteners. Position the lift web protector flaps over the risers.

INSTALLATION OF THE CONNECTOR LINK TIES

To install the connector link ties, cut two 12-inch lengths of 100-pound nylon cord and sear the ends. Do not use waxed cord. Form a 1-inch loop in one end of each cord using a bowline knot followed with an overhand backup knot in the end of the cord.

Position the connector links side by side so that the top lift webs are on the right and the bottom connector links are on the left. Form a noose around the connector links on the helper's side with one of the 100-pound tie cords. Tighten the noose and tie the free end of the tie cord to the bottom inboard cloth retaining band loop with three to four half-hitches; trim the excess cord. Secure the connector links on the packer's side in the same manner.

RELEASE ASSEMBLY LANYARD AND RIPCOARD ASSEMBLY INSTALLATION

Mark the clamp release lanyard 36 inches from the locking pin end, and fold the top end flap onto the container so that the base plate faces up. Position the large slotted end of the base plate clamp under the screwhead on the base plate. Position the manual ripcord housing and power cable housing under the clamp with the two flat sides together and the other two flat sides against the base plate.

Place the clamp in the clamping groove of the two housings. Position the small slotted end of the base plate clamp over the base plate stud. Insert the release lanyard locking pin into the stud hole, and secure the clamp in place. Insure that the two housings are correctly positioned and securely retained. Safety-tie the locking pin to the stud with one turn of waxed size FF nylon thread, single. Pass the thread through the lanyard knot and tie the ends with a surgeon's knot followed by a square knot. Insert the top ripcord pin through the beveled side of the eye in the power cable.

Route the lanyard over the helper's side of the top end flap "V." Tack the lanyard to the top end flap at the "V" with 1/8-inch slack between the locking pin and the tacking, passing the tacking around the lanyard. Use one turn of waxed size A nylon thread, single, tying the ends with a surgeon's knot followed by a square knot. Route the lanyard along the inside of the top end flap to the helper's side of the automatic actuator power cable buttonhole.

Tack the lanyard to the upper edge of the container with one turn of waxed size A nylon thread, single, allowing 1/8-inch slack between the tackings. The tacking passes around the lanyard and not through it. Tie the ends with a surgeon's knot followed by a square knot.

Reeve the lanyard through the lanyard guide grommet. Locate the 36-inch mark on the lanyard over the bar on the inboard connector link positioned on the helper's side. Secure the lanyard to the connector link bar with a bowline knot. The bowline knot must be positioned as close as possible to the connector link bar. Tie an overhand backup knot in the end of the lanyard cord.

Insert the ripcord housing clip into the riser loop attached to the ripcord handle clip. Using size A nylon thread, single, tack through the loop and hole in the ripcord housing clip. Tie ends with a surgeon's knot followed by a square knot. Insert the ripcord handle in the clip.

ATTACHMENT OF LOWER FIRING LANYARD TO SUSPENSION LINE CONNECTOR LINK

Route the lower firing lanyard at the gun between suspension line 21 and 22. Slide the container towards the canopy and form "S" folds in the suspension lines large enough to allow the loop in the end of the firing lanyard to aline with the connector links. Remove the yoke and plate assembly on the outboard connector link located on the helper's side. Insert the connector link bar through the loop in the lower firing lanyard and reattach the yoke and plate assembly. Tighten the screw to a torque value of 20 to 25 inch-pounds.

Apply a tamper dot to the connector link screwhead using insignia red colored lacquer.

STOWAGE OF SUSPENSION LINES

During the stowing operation, insure that the suspension lines do not become loose or rotated and that no suspension lines are left out of the retaining bands. The retaining bands must lie flat around the stows without twists or folded under edges.

The packer must grasp the suspension lines approximately 16 inches from the connector links and form and stow the first suspension line bight in the retaining band farthest from the canopy on the helper's side. During the stowing operation, the canopy is drawn along the packing table only in sufficient lengths to permit suspension line bights to be formed for insertion into the retaining bands.

During the entire stowing operation, the helper assists the packer by holding the container steady and by holding the finished bight while the next bight is being formed.

The second bight is stowed in the retaining band opposite the first stow on the helper's side. There should be 14-3/4 to 15-1/4 inches of line between bights.

The third bight is formed in the same manner as in the previous steps and the bight is stowed in the retaining band next to the first stow.

The packer will stow bights 4 through 8 in the same manner as bights 1 through 3. Bight 9 is stowed in the inboard retaining band across from stow number 8.

Stow bights 10 through 16 in the same manner as bights 1 through 8. There should be 13 to 15 inches of suspension lines between the last stow and the skirt hem.

This distance may be adjusted by increasing or decreasing the length of line between bights 8 and 9.

STOWAGE OF LOWER FIRING LANYARD

Insure that the safety pin is installed in the spreading gun. The packer forms a bight in the lower firing lanyard at the white tape mark on the extractor sleeve. The white tape mark must be 21-1/2- to 22-1/2-inches from the spreading gun.

Stow the first firing lanyard bight in the center of suspension line bight number 16.

Continue stowing the firing lanyard in suspension line bights 15 through 9 in the same manner as in the previous step.

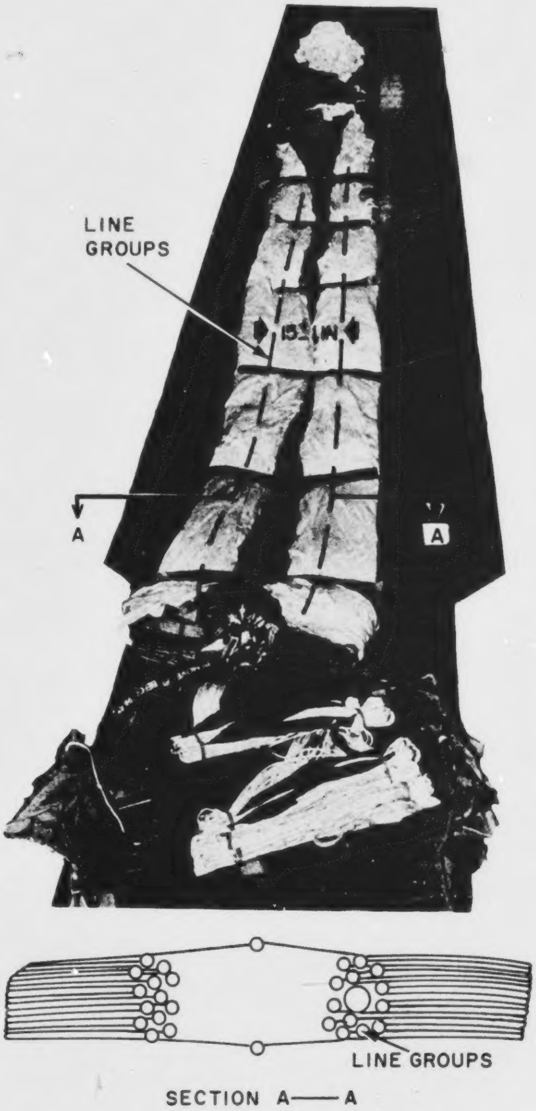
Using a 3/8-inch wood or steel rod with a smooth rounded, end, tuck a 3/8- to 5/8-inch bight of firing lanyard into the retaining band holding bight 8. Position the bight on top of the suspension lines.

Stow a bight of the firing lanyard in suspension line bights 7 through 3 in the same manner as in the previous step. Position the remaining length of firing lanyard between the suspension lines and the outboard connector link on the helper's side of the container.

PREPARATION OF THE CANOPY FOR CANOPY ACCORDION FOLDING

Cut a 36-inch length of 3/8 inch, 18 pound, Class A, Type II nylon tape (no substitute is authorized). Tie an overhand knot in each end of the tape. Insert the tape through the loop on the canopy radial seam, and place the tape across the folded canopy.

Spread the two groups of suspension lines apart approximately 14 to 16 inches along the length of the canopy. This corresponds roughly to the width of the container. (See fig. 7-15.)



PR.205

Figure 7-15.—Suspension line spread.

Fold all gores, as a group on the packer's side at the skirt mid-point of the spreading gun. Allow the canopy to break about at the tie loop for the canopy tie. Keep the canopy in place with three shot bags. (See fig. 7-16.)

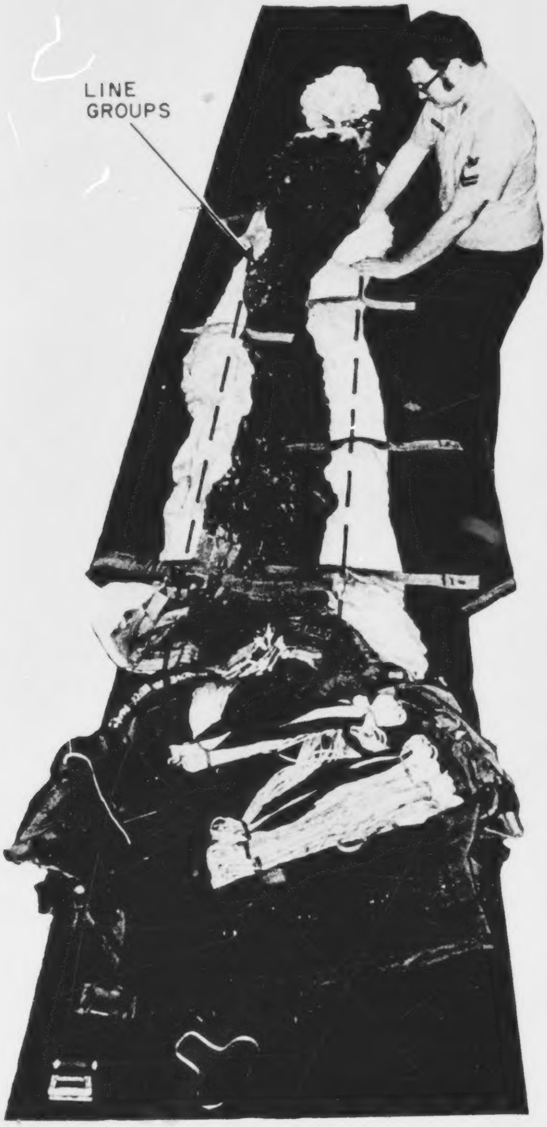
In the same manner, fold all gores as a group on the helper's side. Adjust the canopy gores to obtain a finished width of the canopy of about 20 inches, as shown in figure 7-17.

STOWAGE OF THE SPREADING GUN AND CANOPY

Insure that the safety pin is removed from the spreading gun. Remove the shot bag at the skirt hem. The packer must simultaneously grasp the skirt hem with the left hand and the spreading gun with his right hand. The helper grasps the skirt with the right hand and with his left rotates the container counterclockwise 45 degrees.

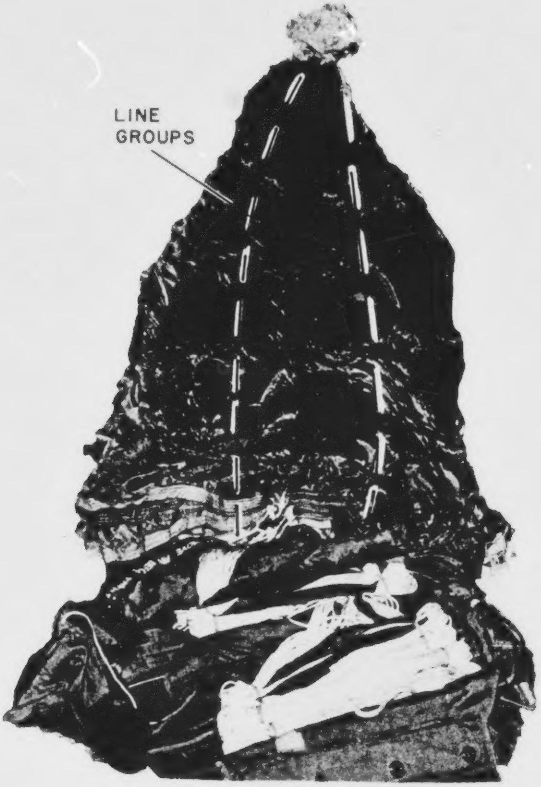
The packer and helper must draw the skirt hem and the spreading gun across the container to the top edge. The spreading gun is positioned with the firing mechanism facing toward the container bottom. (See fig. 7-18.)

With the canopy lowered into position onto the container, the line groups slightly overlap each side of the container. Fan the skirt hem about 20 to 35 degrees. Maintain this fan



PR.206

Figure 7-16.–Canopy break.



PR.207

Figure 7-17.–Canopy width.

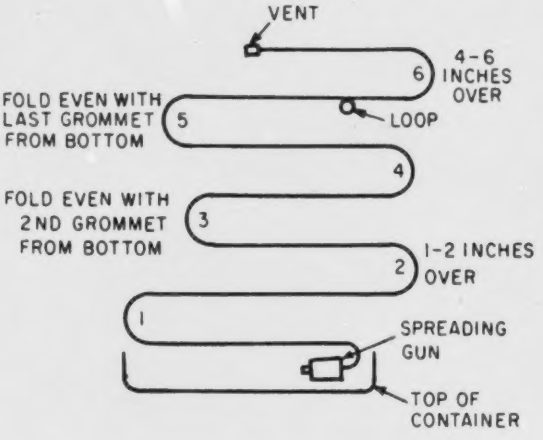
position and with the hand lying flat, insert the skirt into the top corners of the container. Keep the center of the container as free as possible of the canopy bulk.

Both men must stow as compactly as possible the edges of the two gore groups with the related line groups into the container, with a downward, outward motion.

To form the first fold, the packer and helper hold a long bar in place on top of the canopy even with the bottom edge of the container. With their free hands they grasp the canopy about the length of the container from the long bar. They then rotate this fold toward the top of the container. The second fold is extended over the top of the container 1 or 2 inches.

As in the previous step, insert the fold corners into the container corners with the flat of the hands. Work the gore material with the line groups into the sides of the container. Again keep the center of the container as free of canopy material as possible.

To form the third fold, the packer and helper first remove the two remaining shot bags, then


VENT
4-6 INCHES OVER
6
FOLD EVEN WITH LAST GROMMET FROM BOTTOM
5
LOOP
4
FOLD EVEN WITH 2ND GROMMET FROM BOTTOM
3
1-2 INCHES OVER
2
1
SPREADING GUN
TOP OF CONTAINER

PR.208

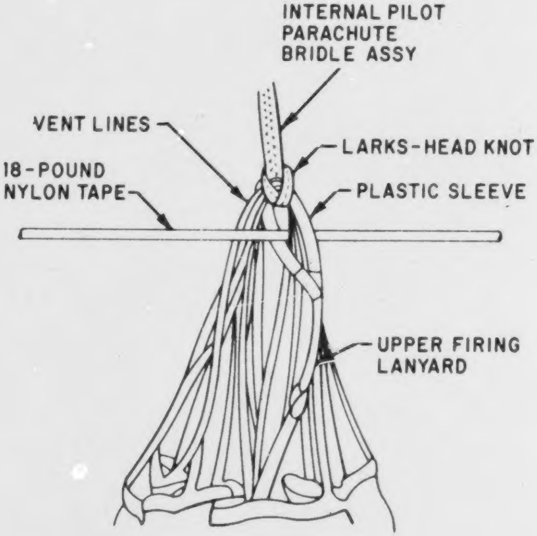
Figure 7-18.—Stowage of the canopy.

hold a long bar in place on top of the canopy even with the second grommet from the bottom of the side flaps. With their free hands both men grasp the canopy, about two-thirds the length of the container from the long bar. They then rotate this fold toward the top of the container. The fourth fold is extended over the top edge of the container 1 or 2 inches.

As in the previous steps, stow the gore material and line groups toward the sides of the container. At this step particular attention must be paid to inserting fold four in the area of the riser slots. The center is still kept clear of gore material as much as possible. Form the fifth fold by holding the long bar even with the bottom set of grommets. Fold six is extended 4 to 6 inches over the top edge of the container. Insure that the canopy tie tape is centered in its loop.

Route one end of the 3/8-inch, 18-pound nyoln tape through the vent lines and the loop in the upper firing lanyard as shown in figure 7-19.

Tie the ends of the tape together with a surgeon's knot. The surgeon's knot should be positioned as near to the end of the tape as possible to insure that the canopy peak is not compressed by pulling the tape up tight.


INTERNAL PILOT PARACHUTE BRIDLE ASSY
VENT LINES
LARKS-HEAD KNOT
18-POUND NYLON TAPE
PLASTIC SLEEVE
UPPER FIRING LANYARD

PR.209

Figure 7-19.—Routing of the 18-pound nylon tape.

Spread the vent hem across the width of the container. Insert fold six into the top corners of the container. Maintain the flow of gore material toward the sides of the container. Care must be taken not to break the canopy tie tape.

Form a deep depression along the center line even with the third grommet from the container bottom. This serves as a platform for the internal pilot parachute. Place the override disconnect assembly on top of the vent hem. Check for entanglements, dips or twists in the pilot parachute connector cord.

Position the pilot parachute vertically on the packing table and insert the guide tube into the grommet in the crown of the pilot parachute. The guide tube should extend to the bottom of the pilot parachute and be positioned over the locking cone in the spring base plate.

Insure that the pilot parachute cloth is neither twisted nor entangled in the compressed pilot parachute spring.

Completely compress the pilot parachute spring, and remove the guide tube from the locking cone. The cone should protrude through the grommet. Pull all nylon cloth away from the locking cone so that no cloth shows through the grommet. Insert the pilot parachute temporary locking pin plate into the bottom hole of the grommet to keep the pilot parachute compressed.

The compressed pilot parachute should be positioned so that the locking cone is alined with the second grommet from the top end of the container. The pilot parachute temporary locking pin plate should extend over the bottom end flap. Roll the pilot parachute cloth under the outer edge of the crown. The external pilot parachute bridle should be routed out the bottom end of the container on the EPC pocket side of the end flap locking cone.

The CDI must insure that the safety pin has been removed from the spreading gun. Also, he must check the folding of the canopy and for removal of the shot bags.

CLOSING THE CONTAINER ASSEMBLY

To close the container, it must be rotated 90 degrees. The packer and helper pull the side flap containing the locking cone over the pilot parachute and folded canopy. They then pull the side flap containing the grommets over the side flap containing the cones. Aline the second grommet from the top of the container on each side flap over the locking cone in the pilot parachute. The helper inserts the temporary locking pin in the top hole in the pilot parachute locking cone. Note the direction in which the temporary locking pin faces.

The packer alines the third grommet from the top end of the container over the locking cone on the opposite side flap. The helper inserts the temporary locking pin in the locking cone. Note the direction of the temporary locking pin. Remove the pilot parachute temporary locking pin plate.

Pass the ball end of the shear link cable attached to the external pilot parachute shear link through the buttonhole in the bottom end flap of the container.

Insert the ball end of the shear link cable firmly into the opening in the external pilot parachute release mechanism. The helper must apply tension to the locking lanyard and retain the tension by inserting a needle through the lanyard across the shoulder of the grommet. The needle must have a warning flag attached.

The helper tucks the bottom end flap under the side flaps using the long bar inserted into the pockets. The packer and helper alines the grommets in the side flaps over the locking cone in the bottom end flap. The packer inserts the temporary locking pin into the locking cone and removes the needle with the attached warning flag. The helper should pull on the shear link cable several times to insure that it is properly locked in the release mechanism. Insure that the external pilot parachute bridle is routed out the bottom end of the container on the stowage pocket side of the end flap locking cone.

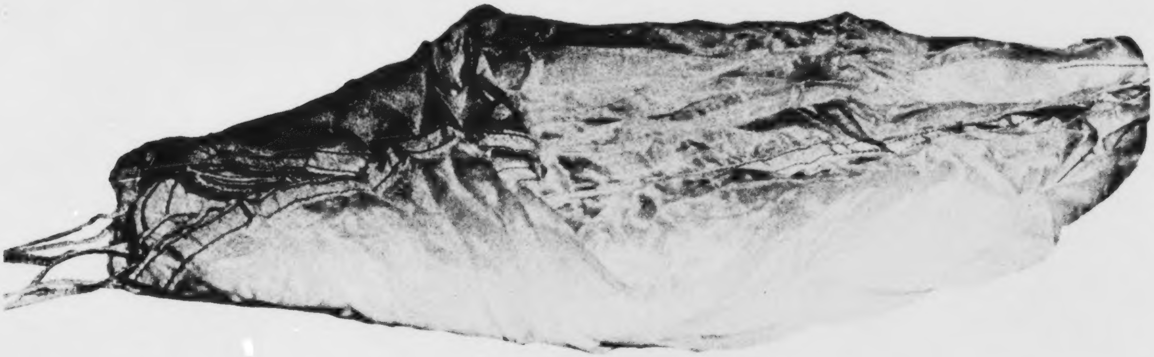
The packer must tuck the top end flap under the side flaps with the long bar while the helper holds the container steady. Aline the grommets on the side flaps over the locking cone on the top end flap. The packer inserts the top ripcord pin into the beveled side of the power cable eye and into the top end flap locking cone. Replace the temporary locking pins with ripcord pins, working from the packer's side to the helper's side of the container. Insure that the ripcord pins are centered in the locking cones so that the shoulder of the ripcord pin is not jammed against the hole in the locking cone, but extends more than 1/4 inch beyond the base of the grommet.

Do not pass the external pilot parachute bridle under the spring opening bands. The parachute will not function properly if the bridle is under the bands. Attach the container spring opening bands to the eyes on the container side flaps and end flaps. Close the ripcord protector flaps.

Insert the ripcord pin lock and attach the spring scale to the ripcord handle by means of a nylon cord. Using a straight, steady pull, observe the initial movement of the ripcord pins. The maximum allowable force required to move the ripcord pins is 27 pounds. Remove the ripcord pin lock upon completion of the ripcord pull test.

FOLDING AND STOWING THE EXTERNAL PILOT PARACHUTE (NB-11)

Remove the dips and twists from the external pilot parachute suspension lines if necessary.



PR.213

Figure 7-20.—Folded pilot parachute hem.

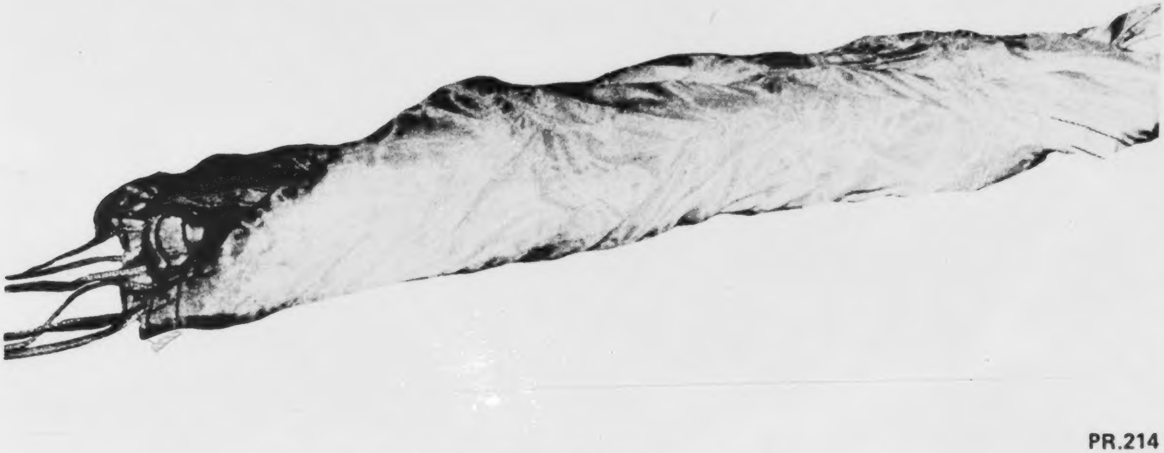
Whip and fold the pilot parachute canopy gores in the same manner as for the main parachute canopy. Fold both sides of the skirt hem together and position it above the radial seams as shown in figure 7-20.

Fold the gores on each side of the radial seams on top of each other above the radial seams as shown in figure 7-21.

Place a long bar over the folded pilot parachute, and fold the peak of the pilot parachute over the long bar so that the pilot parachute is 1 inch shorter than the deployment bag. (See fig. 7-22.)

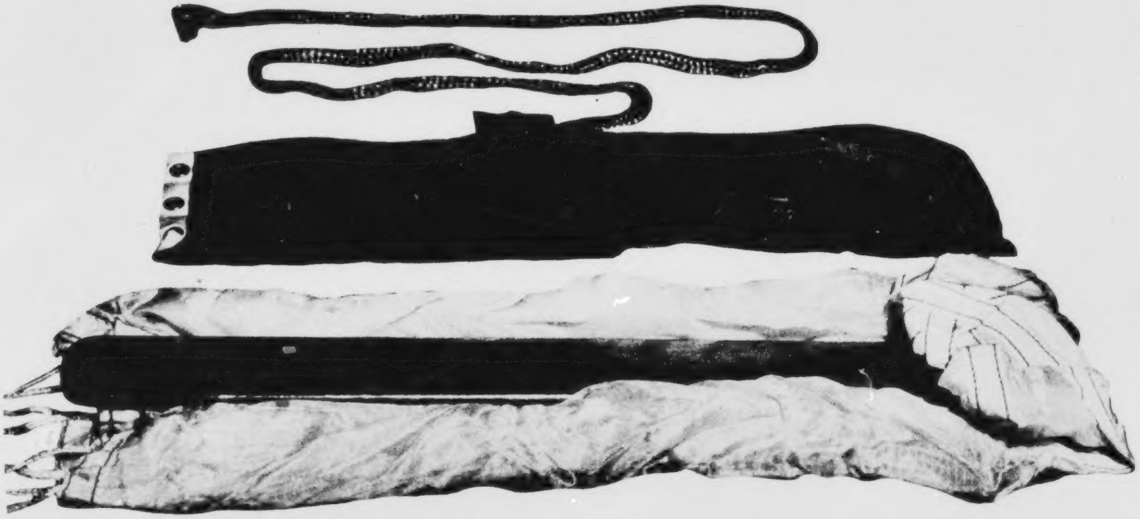
Insert the pilot parachute peak into the deployment bag using the long bar. Remove the long bar. Tie each pair of grommets on the deployment bag together with one turn of waxed size A single nylon thread. Tie the ends with a surgeon's knot followed by a square knot.

Position the deployment bag so that the static line is on the packer's side of the packing table with the hesitator loops facing up. Form a hook bend in the end of a temporary locking pin. The packer stows a bight of the pilot parachute suspension lines in the hesitator loop



PR.214

Figure 7-21.—NB-11 external pilot parachute folded for stowing.



PR.215

Figure 7-22.—Pilot parachute peak folded over a long bar.

farthest from the helper and farthest from the grommets, using the modified temporary locking pin. The remaining suspension lines and four bights of the pilot parachute bridle will be stowed in the same manner.

Position the external pilot parachute shear link in the center of the elastic stow pocket. Insert the deployment bag into the elastic stow pocket with the suspension line stows facing down and located at the top of the parachute container. Stow the excess static line back and forth inside the elastic stow pocket flaps. Close and smooth the elastic stow pocket. Insure that the static line and shear link cable exits the pocket at the bottom. Place the ring on the end of the static line over the arming cable.

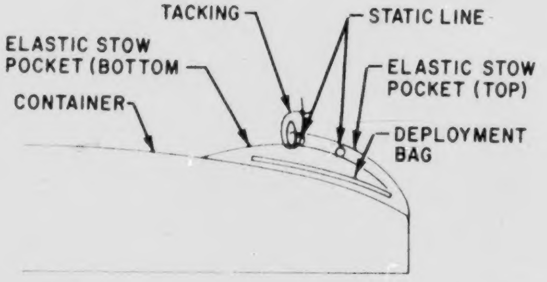
Route a length of waxed nylon 6-cord, single, through the adjacent slots in the actuator arming cable end fitting, and tie the static line to the arming cable end fitting with a surgeon's knot followed by a square knot. In addition, take a piece of nylon 6-cord 8 inches long, double it, and form a loop around the top side of the static line ring. Tie the loop to the top side of the arming cable clip using a surgeon's knot followed by a square knot. Route the static line along the arming cable housing and tack at the appropriate points using waxed size FF, single nylon thread.

Insure that the tacking passes through the static line and around the arming cable housing. Tack the static line through the bottom side of the container. The static line should exit the stowage pocket approximately 2-1/2 inches up from the lower edge of the stow pocket. Starting at the lanyard exit point tack the stowage pocket closed in five places approximately 3-1/4 inches apart.

Use two turns of size FF, single nylon thread. Insure that the tacking passes through the top pocket, static line, and bottom pocket as shown in figure 7-23.

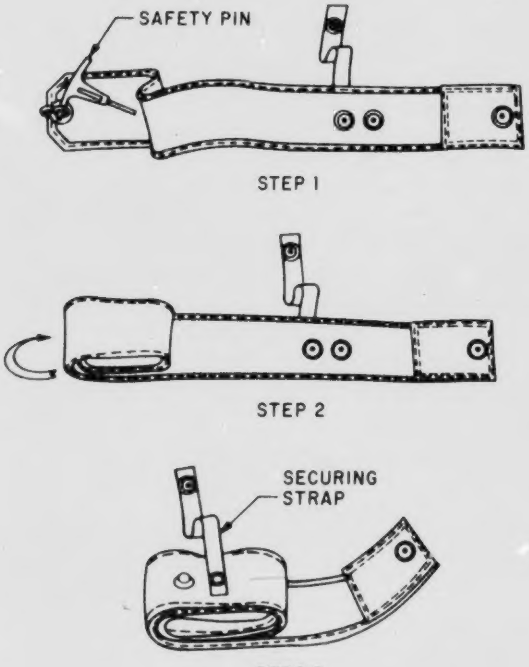
Position the spreading gun safety pin pennant on the table with the securing strap facing down and the safety pin as shown in figure 7-24.

Fold the pennant with the safety pin tucked inside, so that the securing strap faces up. When the pennant is completely folded, pass the securing strap around the kit retention strap, between the container and lap belt, and close the snap


TACKING
STATIC LINE
ELASTIC STOW POCKET (BOTTOM
CONTAINER
ELASTIC STOW POCKET (TOP)
DEPLOYMENT BAG

PR.210

Figure 7-23.—Static line and elastic stow pocket tacking.


SAFETY PIN
SECURING STRAP

STEP 1

STEP 2

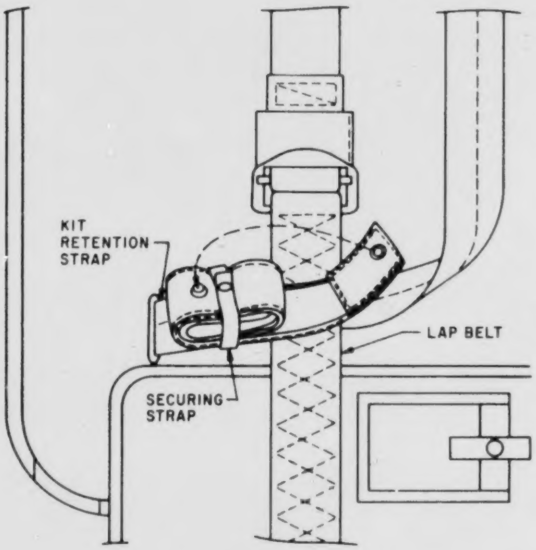
STEP 3

PR.211

Figure 7-24.—Folding the spreading gun safety pin pennant.

fastener. Close the pennant snap fastener. (See fig. 7-25.)

Check the flatness of the packed parachute assembly by using a GO-NO-GO template. If the assembly fails the test, a force of up to 20 pounds maximum (including the weight of the template) can be applied when checking the mold line dimensional requirements. If the assembly still fails to fit under the template, repack the parachute.


KIT RETENTION STRAP
LAP BELT
SECURING STRAP

PR.212

Figure 7-25.—Securing the safety pin pennant to the kit retention strap.

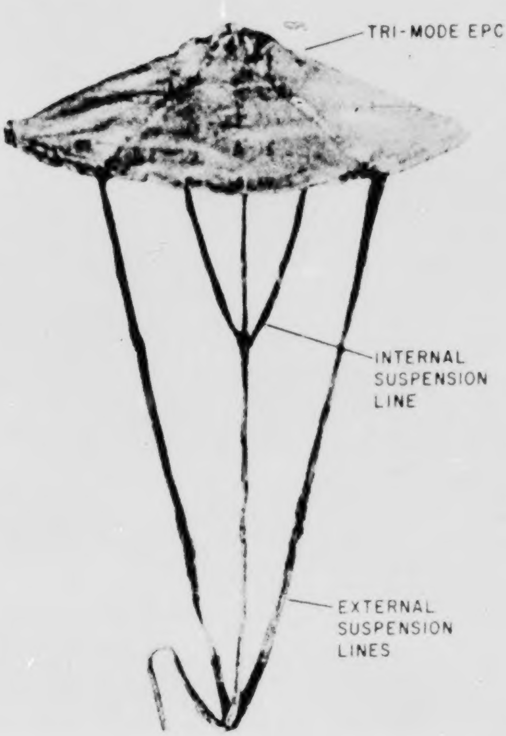
Count the packing tools, recorded earlier, insuring that all are accounted for. The packer must fill out and sign the Parachute History Card and obtain the CDI's initials.

FOLDING AND STOWING THE EXTERNAL PILOT PARACHUTE (EPC) NES-16A

Lay out and fold the Tri-Mode external pilot parachute. Remove the dips and twists in the internal and external suspension lines as necessary.

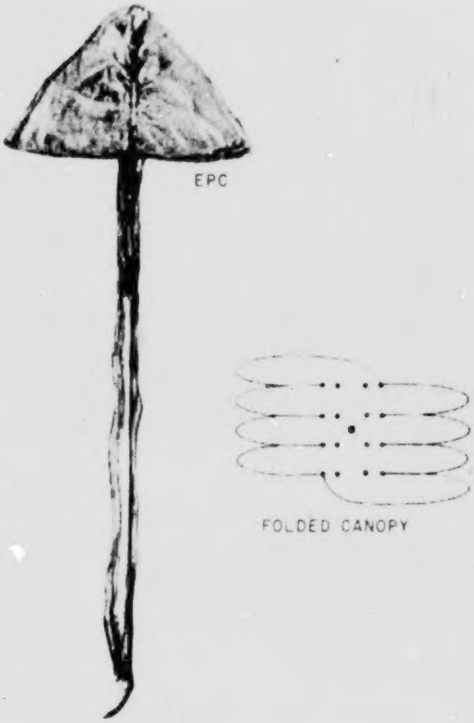
Figure 7-26 shows the Tri-Mode EPC.

Fold the top EPC gore onto the group of gores on the packer's side of the table. At the same time, the helper folds the bottom gore under the group of gores on the helper's side of the table. (See fig. 7-27.)



PR.216

Figure 7-26.—NES-16A Tri-Mode internal pilot chute.



PR.217

Figure 7-27.—EPC gores folded.

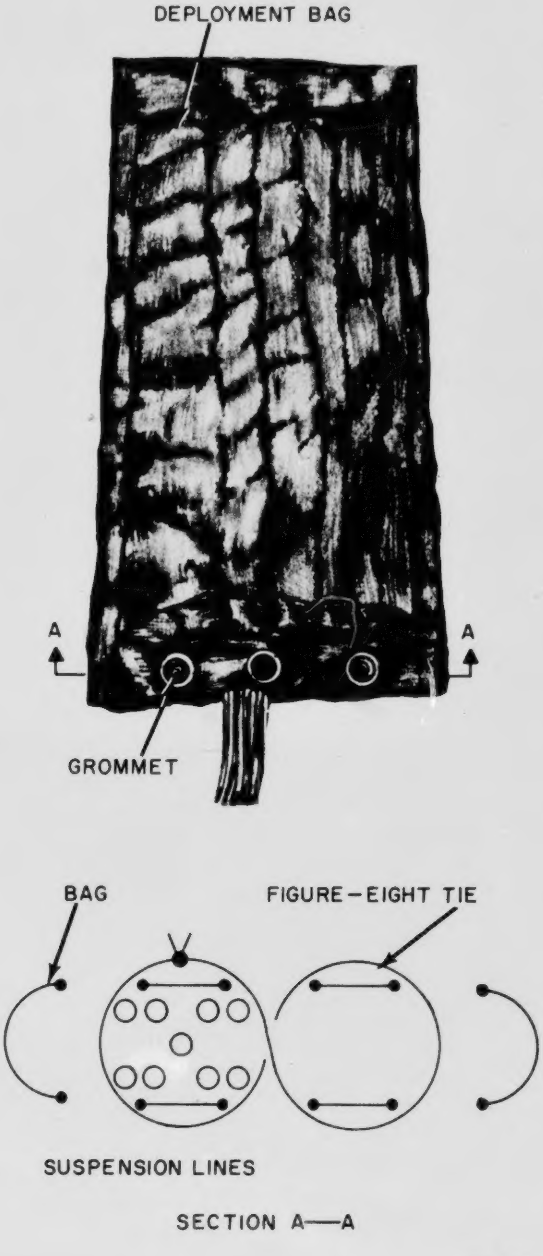
Fold the EPC lengthwise to the width of the EPC deployment bag. Fold the EPC power over to match the length of the deployment bag. Using a long bar, insert the folded EPC into the deployment bag. Safety tie the deployment pouch closed with a figure eight tie through the pouch grommets as shown in figure 7-28.

Use one turn of waxed size A nylon thread. Tie the ends with a surgeon's knot followed by a square knot. Do not twist or rotate the stows in the channels. Also, do not draw the ring into the channels. The ends of the stows should not protrude from the top of the stowage channel. Form and stow a bight of EPC suspension line and bridle in the large stowage channel. Continue stowing the suspension lines and bridle, in sequence.

Attach the packed EPC assembly to the internal pilot chute connector cord. Stow the Tri-Mode EPC assembly in the elastic stow pocket on the container by positioning the shear link in the center of the elastic stow pocket. Insert the deployment bag into the elastic stow pocket with the suspension line stows facing down and located at the top of the parachute container.

Stow the excess static line back and forth inside the elastic stow pocket flaps. Close and smooth the elastic stow pocket. Insure that the static line and shear link cable exits the pocket at the bottom. Place the ring on the end of the static line over the arming cable.

For more detailed information concerning the NB-11 and NES-16A refer to NavAir 13-1-6.2.


DEPLOYMENT BAG
A
A
GROMMET
BAG
FIGURE-EIGHT TIE
SUSPENSION LINES
SECTION A—A

PR.218

Figure 7-28.—Deployment pouch safety tie.

CHAPTER 8

MBEU PERSONNEL PARACHUTE ASSEMBLIES

The MBEU (Martin-Baker) parachutes are designed to be used with the Martin-Baker ejection system. The system is designed to provide safe escape at all altitudes and speeds, and after ejection, to automatically extract the personnel parachute and lift the aircrewman from the ejection seat.

Personnel parachute containers of various shapes are used with the Martin-Baker parachute canopies. The type of container assembly used depends on the design requirements of the seat and the aircraft concerned. Coverage in this chapter is limited to the integrated envelope shaped container.

Although personnel of the AME rating are responsible for the removal and installation of the ejection seat and its components, the PR is responsible for packing and rigging both the drogue and personnel parachute assemblies.

Differences occur in packing of the various types of Martin-Baker parachutes. Therefore, before attempting to pack one of another configuration, be sure to consult NavAir 13-1-6.2, covering the parachute and seat involved.

MBEU 5020PA

The MBEU 5020PA personnel parachute assembly is used with an integrated torso harness suit as part of an ejection seat escape system.

This assembly includes a 24-foot diameter, flat nylon canopy with 24-gores. The canopy is packed in a semirigid, envelope shaped container. The integrated torso harness suit incorporates the aircrewman's parachute harness and provides attachment points for the lap and shoulder restraint systems. The harness is channeled through the torso suit to retain it in position and to facilitate donning.

When aboard the aircraft and seated, the aircrewman connects the quick-release fittings on the parachute riser assembly to the quick-release shoulder fittings on the integrated torso suit. The survival kit is also connected to the integrated torso suit by means of quick-release fittings.

The MBEU-5020-PA personnel parachute assembly is shown in figure 8-1.

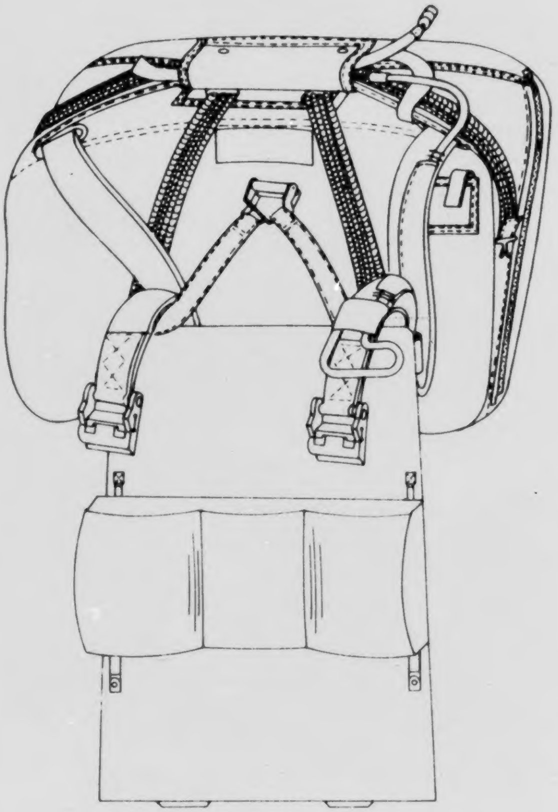


Figure 8-1.—MBEU-5020PA personnel parachute assembly.

CONFIGURATION

Figures 8-2 through 8-9 are illustrations of the subassembly configurations making up the MBEU 5020PA assembly.

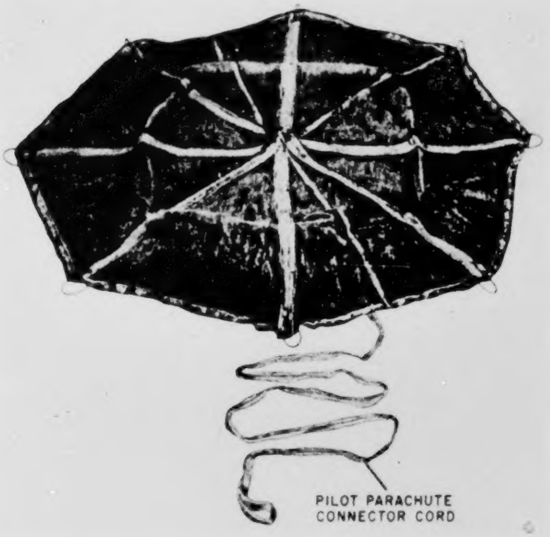


Figure 8-2.—Pilot parachute assembly and connector cord.

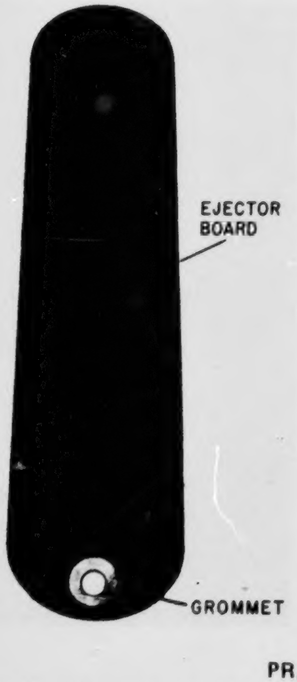


Figure 8-3.—Pilot parachute ejector board.

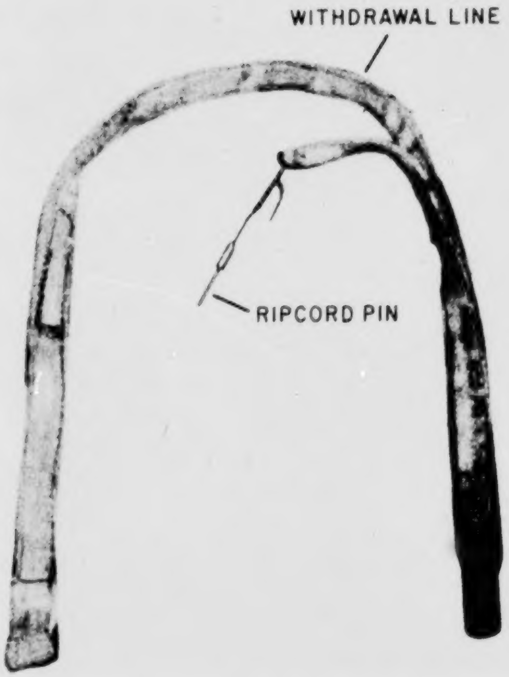
FUNCTIONS

After ejection, the ejection seat drogue gun fires a piston which deploys the controller drogue parachute. The controller drogue parachute, in turn, deploys the stabilizer drogue parachute. The stabilizer drogue parachute remains attached to the seat by a scissor shackle. Drogue parachutes are discussed in chapter 21 of this manual.

The scissor shackle is released at a preset time after ejection (provided the altitude is below the setting of the barostat) by the operation of the time release mechanism. The aircrewman separates from the seat during this operation. When the stabilizer drogue parachute releases from the seat, it pulls the withdrawal line assembly from the container assembly.

As the withdrawal line reaches full stretch, the ripcord locking pins are removed from the locking cones, permitting the grommets, locking cones, and end tabs to disengage. The container spring opening bands pull the end and side flaps apart, allowing the withdrawal line, which is attached to the peak of the main canopy, to extract and deploy the main canopy.

If the ejection seat time release mechanism fails to operate, or if crash rescue becomes necessary the aircrewman can manually disengage himself from the seat by pulling the emergency harness release handle. In this case the guillotine assembly will cut the individual line securing the drogue parachutes to the peak of the main canopy and release the seat/aircrewman retention system. The aircrewman must then push himself clear of the seat. In the injection sequence, the manual ripcord handle is then pulled deploying the pilot parachute which deploys the main canopy. As the aircrewman falls, the pilot parachute causes the canopy to be pulled from the container assembly, followed by the suspension lines. The canopy starts to fill with air during this operation.



PR.245

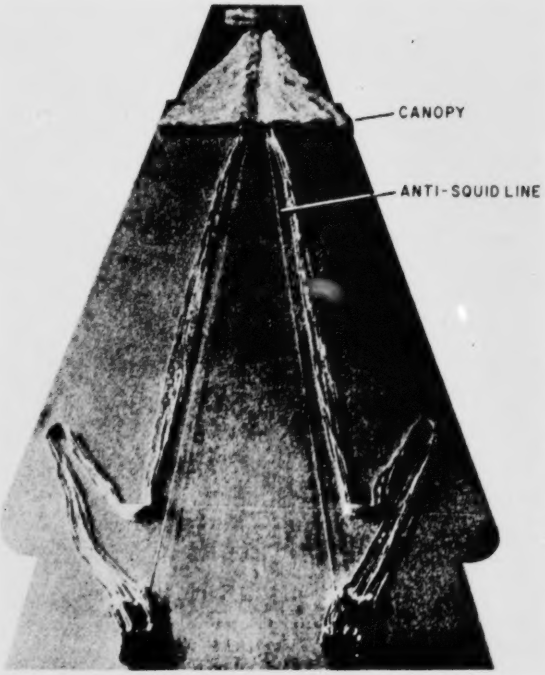
Figure 8-4.–Withdrawal line assembly.

The riser fasteners are released as load is applied. The lift webs are then pulled from the container assembly and the connector link ties break, during which time the canopy fully opens. The aircrewman hangs suspended in his harness from the quick release shoulder fittings during descent.

NOTE: The anti-squid lines may break during high speed openings.

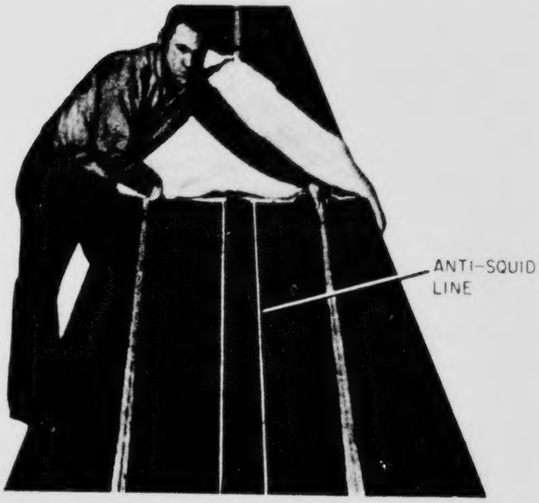
Upon landing, the aircrewman can disengage the canopy and suspension lines from the integrated torso harness suit by using the quick release shoulder fittings.

Prior to packing, the MBEU 5020PA personnel parachute assembly must be updated by comparing the configuration of the assembly with the modifications listed in NavAir 13-1-6.2.



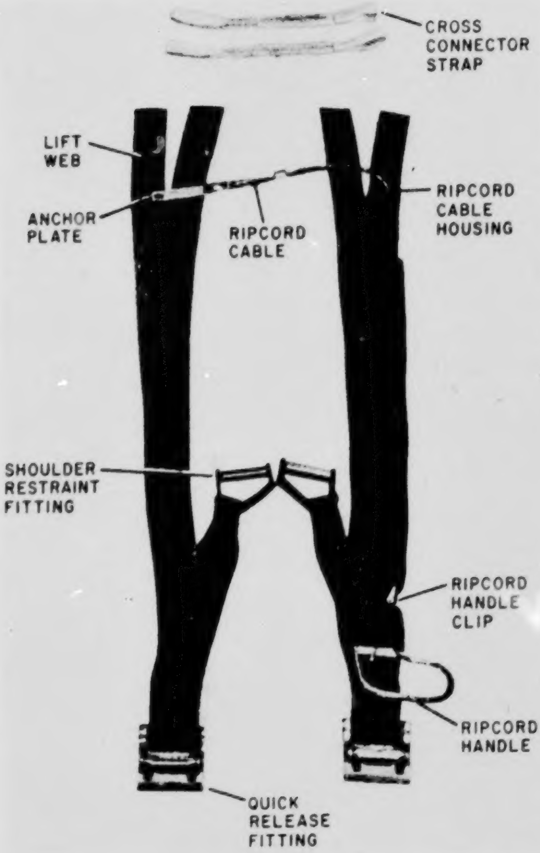
PR.219

Figure 8-5.–Canopy assembly.



PR.220

Figure 8-6.–Anti-squid lines.



PR.221

Figure 8-7.—Riser and ripcord assembly.

RIGGING AND PACKING

At the time of issue, the MBEU 5020PA assembly should be rigged and packed using the procedures discussed in the following section. Subsequent packings of the assembly should be accomplished in the same sequence, omitting the procedure for attachment of the suspension line connector links to the risers.

During the rigging and packing procedures, the packer is positioned on the left side of the packing table and the helper on the right when facing the canopy from the harness/riser end of the packing table. Rigging and packing is accomplished in eight operations as follows:

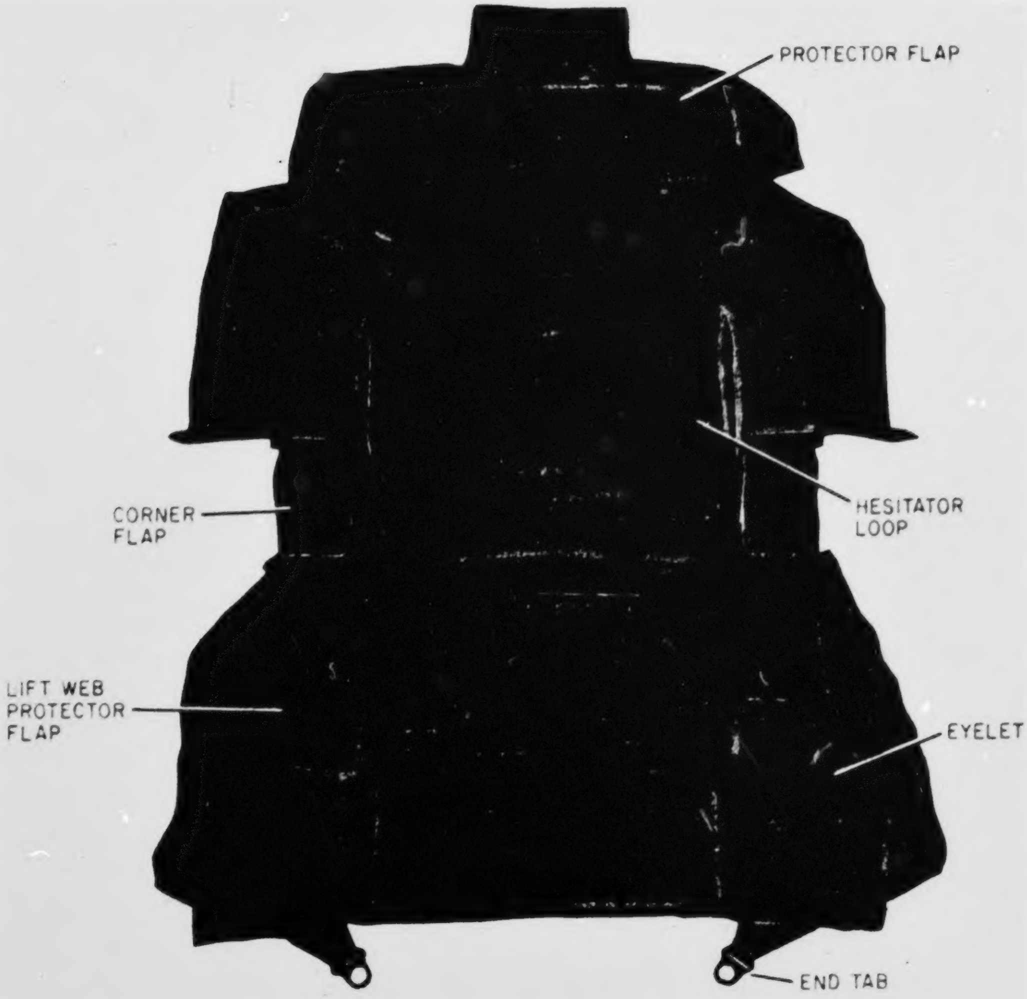
1. Preliminary procedure.
2. Suspension line continuity check.
3. Attachment of the suspension line connector links to the riser assembly.
4. Whipping and folding the canopy gores.
5. Attachment of the parachute container assembly to the riser assembly.
6. Stowage of the suspension lines.
7. Stowage of the canopy.
8. Closing the parachute container.

Preliminary Procedures

To prepare the parachute assembly for rigging and packing, proceed as follows:

1. Inspect the complete parachute assembly using the procedures discussed in chapter 2 of this manual.
2. Lay out the packing tools on the packing table and check them for nicks, burrs, or sharp edges which could damage the parachute assembly. Count and record the number of packing tools.
3. Lay out the canopy assembly full length on a clean table. Locate the canopy gore with the nameplate and place it uppermost in the center of the table.
4. Separate the suspension lines into two equal groups, counting 12 suspension lines on each side of the nameplate gore.
5. Arrange the two groups of 12 suspension lines on each side of the nameplate gore in accordance with figure 8-10. The numbers in figure 8-10 illustrate the location and orientation of the suspension lines on the connector links when facing the canopy from the connector link end of the table.
6. Place the connector link holding suspension lines 1 through 6 and one anti-squid line on top of the connector link holding suspension lines 7 through 12. Place the connector link holding suspension lines 19 through 24 and one anti-squid line on top of the connector link holding suspension lines 13 through 18. Connect these two groups of connector links to their respective tension hooks on the packing board.

NOTE: Insure that the knurled portions of the connector link yoke and plate assemblies face up and the screw heads face outboard.


PROTECTOR FLAP
CORNER FLAP
HESITATOR LOOP
LIFT WEB PROTECTOR FLAP
EYELET
END TAB

PR.222

Figure 8-8.—Container assembly (inside).

7. Insure that the pilot parachute and ejector board are securely attached to the canopy vent lines. The anti-squid lines must be secured at the canopy peak and connector links.

8. Compress and secure the pilot parachute spring ribs with two or three half hitches of the pilot parachute suspension lines.

Suspension Line Continuity Check

To check the suspension line continuity, use the procedures as follows:

1. Attach the tension strap to the loop in the end of the withdrawal line and tighten it securely.

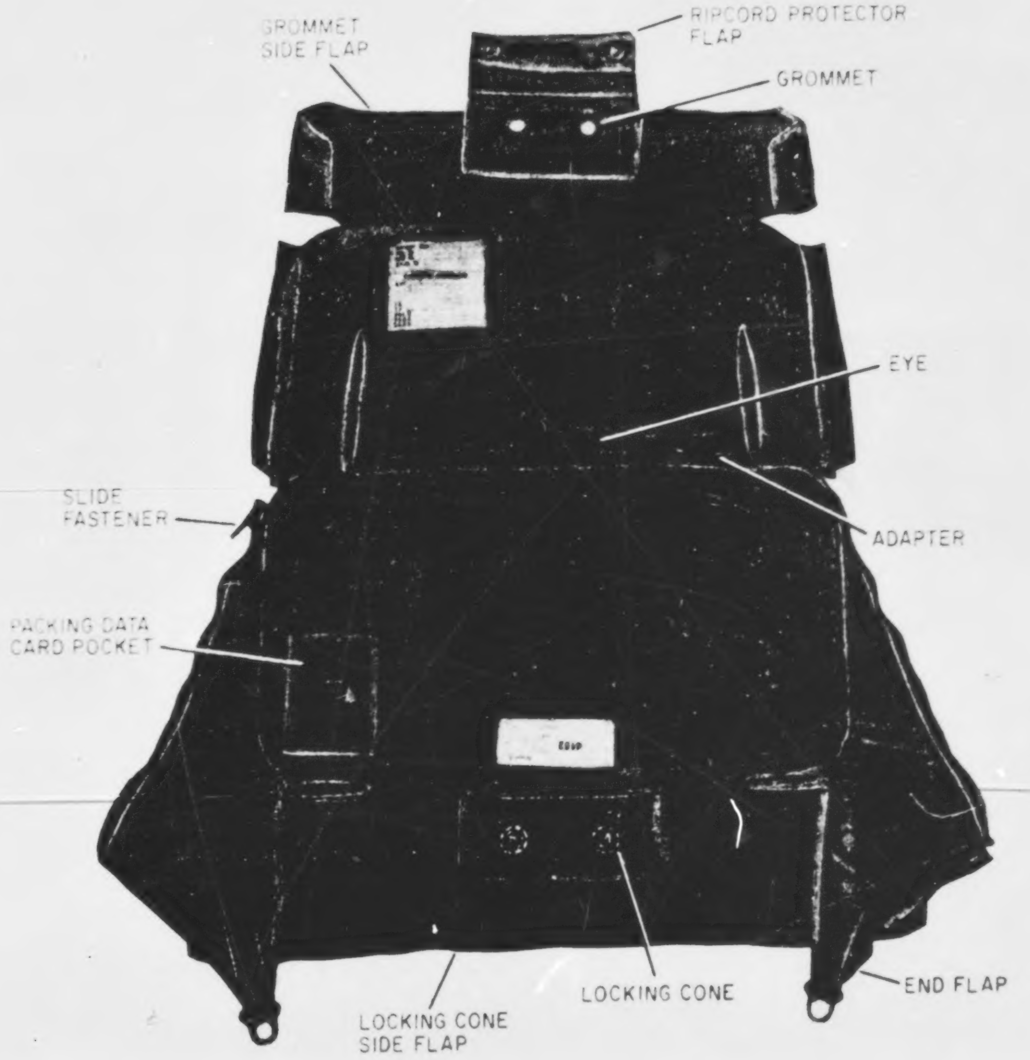
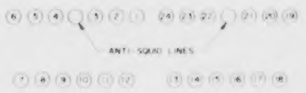

GROMMET SIDE FLAP
RIPCORD PROTECTOR FLAP
GROMMET
EYE
SLIDE FASTENER
ADAPTER
PACKING DATA CARD POCKET
LOCKING CONE
END FLAP
LOCKING CONE SIDE FLAP
PR.223

Figure 8-9.—Container assembly (outside).

2. The packer and helper must grasp the canopy approximately 3 feet from the peak and pull toward the peak, applying tension to the suspension lines. Place shot bags on the canopy to hold it in place. Record the number of shot bags used.

3. The suspension lines should be arranged on the connector links as shown in figure 8-10 when viewed from the connector link end of the packing table. They should run free from the skirt hem to the connector links without dips or twists. Insure that the suspension lines are taut at all times.

4. The packer starts with line 1 on the left side of the nameplate gore and works through line 12.



PR.224

Figure 8-10.–Arrangement of suspension lines on the connector links.

5. The helper is positioned at the connector links to check each suspension line selected by the packer for continuity, dips, and twists.

6. The suspension lines on the right side of the nameplate gore are checked in the same manner, except that the packer starts with line 24 and works through line 13.

7. The anti-squid lines must run free from the vent lines to the connector links, passing under the top groups of suspension lines and attaching at the center of the top connector links between lines 3 and 4 on one side, and 21 and 22 on the other side. See figure 8-10 for the anti-squid lines placement.

Attachment of the Suspension Line Connector Links to the Riser Assembly (Original Issue Only)

To attach the suspension line connector links to the riser assembly, proceed as follows:

1. Lay out the riser assembly and cross connector straps on the packing board. Corresponding lift webs should be placed on top of each other and positioned at the connector links. The ripcord assembly must face up.

2. Remove the connector links from the tension hooks.

3. Remove the connector link yoke and plate assembly from each connector link. Insert the bottom connector links through the loops in the ends of the cross connector strap and the loops in the bottom lift webs.

Reattach the yoke and plate assemblies to the bottom connector links and tighten the screws to a torque value of 20-25 pound inches. Apply a tamper dot to the screwhead of each connector link using lacquer, insignia red or equivalent.

4. Attach the top lift webs and cross connector strap to the top connector links. Insert the connector links into the tension hooks.

5. Recheck the suspension line continuity and remove all shot bags from the canopy.

6. The CDI must witness the attachment and torquing of the connector links.

Whipping and Folding the Canopy Gores

Procedures for whipping and folding the canopy gores are as follows:

1. Route the suspension lines around the packing board spools. Tighten the packing board tension strap, applying tension to the suspension lines.

2. The packer and helper must lift the two suspension lines on each side of the nameplate gore up and out.

The skirt hem between the lines should be taut so that the canopy peak can be seen on the inside. While holding the suspension lines up, each man must whip the gore hanging from the line outwards to prepare the canopy for folding.

3. Draw the next suspension line upwards to the suspension line held in the hand, using a rapid, circular motion.

4. Continue the whipping operation for all gores. Move the whipped gores rapidly back and forth across the table. Insure that the radial seams are not overlapped by the gores.

5. The two groups of suspension lines should be stretched to the edges to the packing table with the folded gores hanging over the sides. The packer and helper now grasp all of the folds at the outer edges and hold the suspension line groups at the edges of the packing table. The packer and helper simultaneously move the folds up and down rapidly, in a whipping motion, to eliminate any wrinkles.

6. The packer will flap the top gore up and down at the skirt hem center as the helper holds the bottom gore at the skirt hem center.

7. On signal, both men draw their respective gores, at the skirt hem centers, toward the table edge while at the same time bringing the suspension line groups to the center of the table.

8. Insert the suspension line groups into their respective slots in the suspension line separator and place a shot bag on the lines. The packer

places a second shot bag across the skirt hem on the left side of the suspension lines.

9. The helper rotates all of the gores, except the bottom one, from the right side over to the left side of the packing table.

10. The helper now straightens and smooths the bottom gore on the right side of the packing table throughout its length to the peak.

11. The packer returns the folded gores above the shot bag to the right side of the packing table.

The helper straightens and smooths the top gore and places a shot bag on the skirt hem.

12. The packer rotates all gores, except the bottom gore, from the left over to the right side of the packing table.

13. The packer straightens and smooths the bottom gore on the left side of the packing table throughout its length to the peak.

14. The helper returns the folded gores above the shot bag to the left side of the packing table, and the packer straightens and smooths the top gore.

15. The packer and helper grasp the skirt hem at the folded ends and rotate them toward the suspension lines.

16. Each folded gore is alined and counted as it is placed back onto the packing table.

17. The skirt hem is made neat by having all V-tab reinforcements alined in the same direction on top of each other. Each group of folds on the left and right of the suspension lines contain 12 gores.

18. The canopy is folded by the packer placing his hand on the helper's side of the skirt hem at the center. The helper now rotates all the gores to the center of the canopy.

19. The helper must place his hand on the packer's side of the skirt hem at the center. The packer rotates the gores to the center of the canopy. The two groups of folded gores should butt together. Note that the canopy cannot be folded through its entire length but breaks approximately two thirds the distance to the peak.

20. Place one shot bag slightly behind the skirt hem and another at the middle of the canopy.

Attachment of the Parachute Container Assembly to the Riser Assembly

To attach the parachute container assembly to the riser assembly, use the procedures as follows:

1. Remove the suspension lines from the packing board and remove the packing board from the table. S-fold the supension lines approximately halfway between the connector links and the skirt hem. Remove the tensioning strap from the peak of the canopy.

2. Position the fully opened container assembly under the risers and suspension lines with the hesitator loops facing up and on the side closest to the canopy.

3. Tie the inboard side of each connector link together using one turn of waxed size FF nylon thread, single. Tie the ends with a surgeon's knot followed by a square knot.

NOTE: On newer assemblies, secure the risers to the container with snap fasteners provided and do not perform the following step.

4. Tack the outboard side of the connector links to the container panel between the third and fourth ridges in the stiffener, using waxed size FF nylon thread, single. Tie the ends with a surgeon's knot followed by a square knot.

5. Route the risers through the slots in the end of the container. Tie the slots closed using the grommets provided. Use size FF nylon thread, single. Tie the ends with a surgeon's knot followed by a square knot.

Stowage of the Suspension Lines

Stowage of the suspension lines is accomplished by using the following procedures.

NOTE: The anti-squid lines are not stowed until the fifth bight.

The helper must grasp and form the first bight 14 to 16 inches from the connector links. He then stows the first bight on his side of the container, nearest the connector links, extending the bight of maximum of 3/4 inch beyond the hesitator loop.

The packer and helper alternately stows the second, third, and fourth bights in the same manner. The anti-squid lines run under the stowed suspension lines. Insure that the lines are not twisted or loose and that no lines are left out of the hesitator loops.

Before stowing the anti-squid lines, pull on the canopy peak to insure that the canopy is fully extended. The helper now forms and stows the fifth bight, including the anti-squid lines. Together, the packer and helper continue stowing both suspension lines and anti-squid lines until all hesitator loops are filled.

Remove the shot bag and suspension line separator from the suspension lines prior to stowage of the last bight. There should be 5 to 10 inches of suspension line between the last stow and the canopy skirt hem.

Lay the suspension line protector flap over the stowed suspension lines. Tie the flaps in place using the loops provided. Use waxed size FF nylon thread, single. Tie the ends with a surgeon's knot followed by a square knot. If necessary, unfold the corner protective flaps. Remove the shot bags from the canopy.

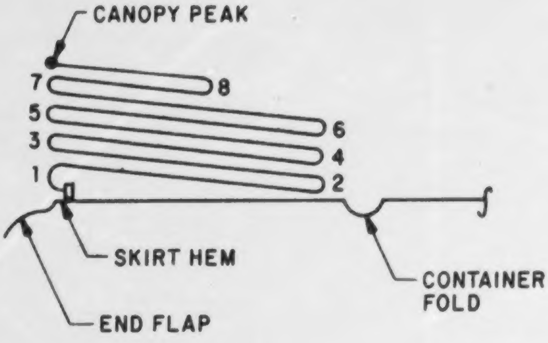
Stowage of the Canopy

To stow the canopy, aline the canopy skirt hem with the top edge of the container. Insert a long bar one container length above the skirt hem. Both men must hold the canopy skirt hem in place and draw the canopy across the container. The canopy should aline with the base of the container and be spread out to the edge of the container. Accordion fold the remainder of the canopy in the same manner. Maintain the canopy spread to the sides of the container.

Aline the canopy vent hem with the top edge of the canopy folds. The last fold may be adjusted as necessary. (See fig. 8-11.)

Fold the front panel over the canopy. Engage and close the slide fasteners on either side of the container. Insure that the canopy fabric is not trapped in the fastener.

Place the container in the container stand. Tuck the canopy well down inside the case. Route the withdrawal line and pilot parachute connector cord out the ripcord side of the container



PR.225

Figure 8-11.–Stowage of canopy.

Closing the Parachute Container

To close the parachute container, proceed as follows:

1. Draw the cone side protector flap and then the grommet side protector flap over the canopy.
2. Draw the locking cone flap over the protector flaps. Place the ejector board on the edge of the locking cone flap.
3. Pull the grommet flap over the ejector board and locking cone flap and aline the grommets over the locking cones. Insert the approved type temporary locking pins.
4. Pull up the end flap opposite the ripcord and remove the temporary locking pin. Place the end tab over the locking cone and reinsert the temporary locking pin; note the direction of the temporary locking pin.
5. Lift the pilot parachute by the connector cord and check for dips and twists in the pilot parachute suspension lines.
6. Place the pilot parachute on the packing table, with the inside facing up. Prior to folding the pilot parachute canopy, note the position of the pilot parachute spring bracket. When the pilot parachute is inserted into the container, it should be positioned so the long flat sides of the bracket are parallel to the ejector board.
7. Fold the pilot parachute canopy so that a square is formed with the spring ribs positioned at the corners. Fake the pilot parachute suspension lines and all but 10 inches of the

connector cord on the top of the folded pilot parachute canopy. Route the pilot parachute connector cord out one corner of the folded canopy at right angles to the faked suspension lines.

8. Fold the pilot parachute spring ribs together and draw out the pilot parachute gores forming four triangular folds.

9. The helper must insert the folded pilot parachute, peak first, into the container and position it between the side flap containing the grommets and the ejector board. The flat sides of the spring bracket should be parallel to the ejector board.

10. Fake the remainder of the pilot parachute connector cord in the corner of the helper's side of the container.

11. Pull up the ripcord end flap and remove the temporary locking pin. Place the end tab over the locking cone and reinsert the temporary locking pin. Insure that the withdrawal line is routed out the front corner at the ripcord end flap.

12. The packer now removes the temporary locking pins from the locking cones as the helper holds the flaps in position. The packer alines the anchor plate over the locking cones and inserts the temporary locking pins into the locking cones. Note the direction that the temporary locking pins face.

13. The helper must insert the curved ripcord pin through the eye in the manual ripcord cable. The packer removes the temporary locking pins as the helper inserts the ripcord pins into the locking cones. Check the routing of the withdrawal line; it must not be routed around the ripcord cable. Connect the two rear spring opening bands.

14. Position the protector flap over the ripcord locking pins. Fold the withdrawal line over the protector flap.

15. Snap the protector flap closed.

16. Remove the container from the container stand.

17. Engage the four remaining container spring opening bands. Crimp the hook at the container end to the eyelet. Do not crimp the flat end hook.

18. Engage the shoulder restraint fittings.

19. Tie the slide fastener tabs to the eyelets in the side flap with one turn of waxed size FF nylon thread, single. Tie the ends with a surgeon's knot followed by a square knot.

20. Count the packing tools; insure that all are accounted for.

21. Fill out and sign the Parachute History Card, obtain the CDI's initials on the card.

22. The CDI inspection requirements must be performed in accordance with information contained in NavAir 13-1-6.2.

CHAPTER 9

AUTOMATIC PARACHUTE ACTUATORS

The automatic parachute actuator currently in use by the Navy in personnel parachute assemblies is a barometrically controlled, pyrotechnic device. The actuator is designed to open a parachute at a preset altitude of either 14,000 (±500) or 10,000 (±500) feet above mean sea level (MSL).

Automatic actuator altitude settings depend on type of aircraft and parachute application. Currently all actuators used in T-2, T-28, T-34, and A-5 series aircraft must be set to fire at 10,000 (±500) feet above mean sea level. All other actuators must be set to fire at 14,000 (±500) MSL.

The following models of actuators are approved for service use: 1000-D; 1000-F; 153-100; and the (Hi Tek) 7000.

FUNCTIONS

When an aircrewman bails out at an altitude above that for which the actuator is set to open the parachute, the arming pin is pulled. This pin locks the actuator firing mechanism while installed. When the arming pin is withdrawn, the assembly will fire at or below the preset altitude for the actuator. The sear and aneroid mechanism locks the actuator. As the aircrewman free-falls, increasing air pressure causes the aneroid to contract. As the operating altitude is reached, the aneroid contracts enough to remove the sear from the firing hammer lock. The hammer's firing pin strikes the time delay cartridge which fires 3/4, 2 or 3 seconds after the hammer strikes, depending on the type of cartridge used. A piston is forced forward in the barrel and pulls the power cable, which is attached to the parachute locking pins. The locking pins are pulled and the standard parachute opening sequence begins.

When an aircrewman bails out below the operating altitude of the automatic actuator, the hammer releases as soon as the arming pin is pulled and the hammer's firing pin strikes the time delay cartridge. The remainder of the sequence is the same as described in the preceding paragraph, after the hammer's firing pin strikes the cartridge.

PREPARATION FOR USE

Upon removal of the actuator from the shipping carton, the exterior parts of the unit must be inspected for damage during shipping and storage. An inspection should be made for corrosion, dirt, dents, and cracks. If any damage or discrepancy is found, a tag must be affixed to the actuator, stating that the actuator is not to be used. Remove this tag only after correction has been made. Fired actuators must not be reused.

All Model 7000 actuators that fail any inspection points must have a tag affixed stating the nature of defects.

NOTE: The cartridge service life is 5 years from the date of manufacture or 18 months after opening of the original package, whichever occurs first. The cartridge service life must not expire prior to the next scheduled repack of the parachute assembly.

WARNING: Exercise extreme caution when handling automatic actuators after the cartridge has been inserted in the barrel. Do not allow either end of the cover assembly to be pointed toward the face as flame and smoke may result in injury. Another reason for extreme caution is the possibility that the piston of the actuator may become a projectile if the cartridge accidentally fires.

An automatic actuator in service must be inspected each time its parachute assembly is repacked. Supervisors must insure attention to detail when work is performed on an actuator. The importance of careful work must be impressed upon personnel actually performing the work, as well as those assigned to collateral duty inspections. A more detailed source of information concerning automatic actuators is found in chapter 3 of the Air-Crew Systems Manual, Personnel Parachutes, NavAir 13-1-6.2.

MODEL 7000

The Model 7000 is scheduled to eventually replace all other models now in use. Figure 9-1 shows an exploded view of the Model 7000 automatic actuator.

Model 7000 automatic actuators are available with either of the two previously mentioned preset altitude settings incorporated, and their use depends on aircraft application. The 10,000-foot actuator is identified by green labels on the receiver and barrel assembly and cover and power cable housing assembly. The 14,000-foot actuator uses red labels.

NOTE: Do not interchange or mismatch the cover and power cable housing assemblies and barrel and receiver assemblies. Serial numbers on the cover and power cable housing and receiver and barrel assemblies are matched and require CDI (collateral duty inspector) verification inspection.

INSPECTION

Prior to inspecting the Model 7000 actuator the unit must be disarmed.

WARNING: Do not pull the arming cable from the armed actuator assembly, as this will cause inadvertent firing.

To disarm, remove the actuator from its pocket only the required distance necessary to allow for disassembly. Remove the locking screw washer and slide the cover off the receiver and barrel assembly. Disengage the barrel snap-lock and remove the cartridge from the barrel assembly, as shown in figure 9-2.

Removal of the arming cable housing from the actuator can be accomplished by depressing the safety retainer release. (See fig. 9-1.)

The actuator, arming cable, and arming cable housing can now be removed from the parachute container.

Firing altitude checks are accomplished in the following manner:

1. Install the test chamber arming pin in the actuator.
2. Install a dummy test cartridge.
3. Reassemble the unit by pressing the barrel downward into position in the receiver. As the barrel reaches the correct position, exert forward pressure on the snap-lock; this causes the snap-lock pins to lock the barrel in position. (See fig. 9-3.)
4. Position the barrel and receiver in the test chamber.
5. For the 10,000-foot actuators, evacuate the test chamber to an altitude of 12,000 feet above MSL.
6. For the 14,000-foot actuators, evacuate the test chamber to an altitude of 16,000 feet above MSL.
7. Remove the test chamber arming pin from the actuator.
8. Decrease the test chamber altitude at a rate of 175 to 200 feet per second.
9. Observe and record the exact altitude at which the actuator firing pin strikes the dummy cartridge.

NOTE: The 10,000-foot actuator must fire at 10,000 (±500) feet above MSL. The 14,000-foot actuator must fire at 14,000 (±500) feet above MSL.

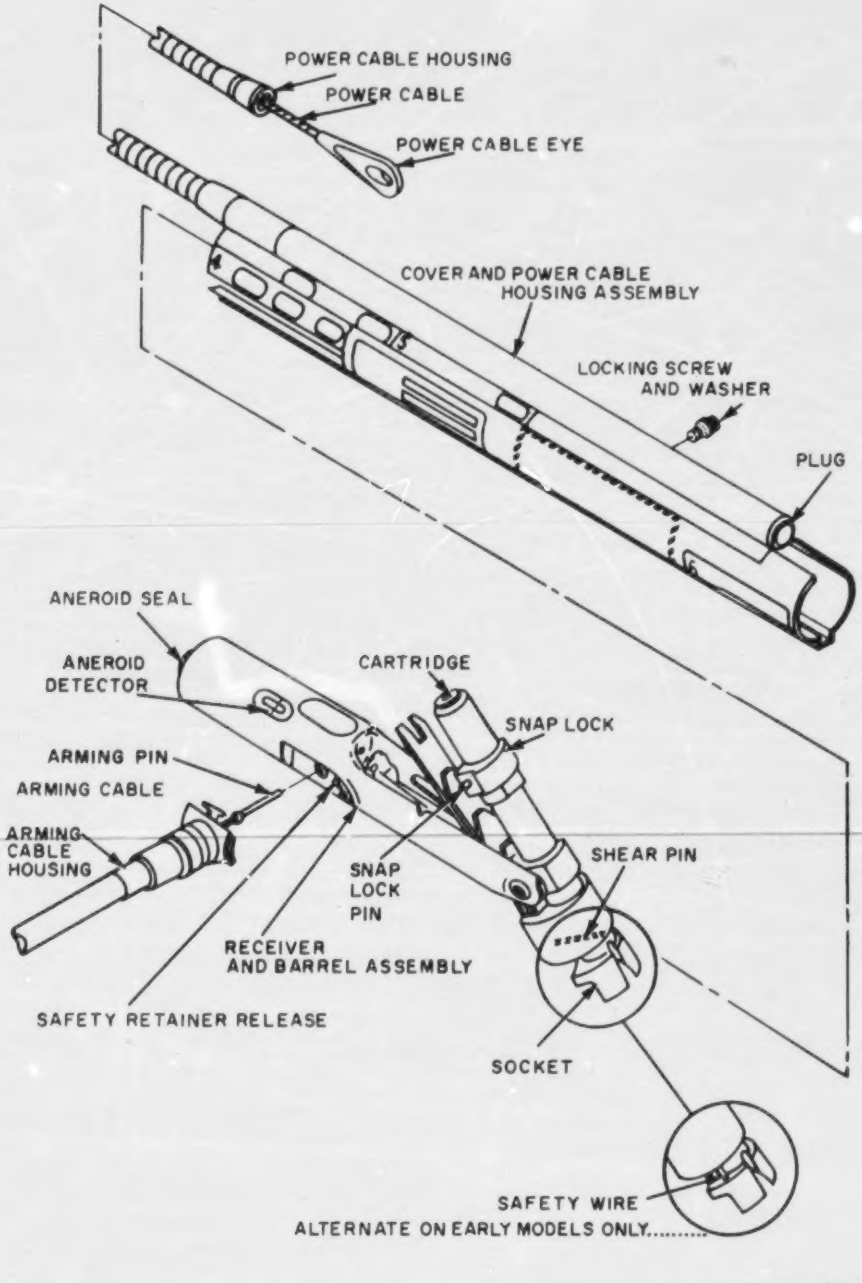
10. A total of three altitude firing checks must be performed on each actuator. Any actuator failing to meet any of the test requirements on any of the three tests must be rejected; no adjustments are authorized.

NOTE: To prevent firewall distortion, never release the actuator firing mechanism without a dummy cartridge being installed.

11. Remove the dummy test cartridge, and inspect for indent caused by contact with the hammer firing pin; the indent must be present. The dummy test cartridge is no longer serviceable and must be discarded.

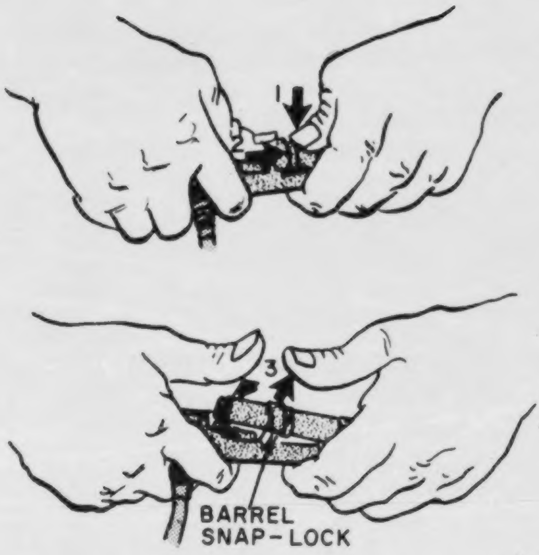
NOTE: Collateral duty inspection (CDI) steps are indicated at various points throughout the actuator inspections; refer to the applicable Shop Process Cards. All work must stop at each of these inspection steps; progress may be continued only after inspection of each CDI step.

To complete inspection of the Model 7000 actuator, examine all parts for nicks, corrosion, distortion, or any other damage. In addition, perform the following inspections:


POWER CABLE HOUSING
POWER CABLE
POWER CABLE EYE
COVER AND POWER CABLE HOUSING ASSEMBLY
LOCKING SCREW AND WASHER
PLUG
ANEROID SEAL
ANEROID DETECTOR
CARTRIDGE
SNAP LOCK
ARMING PIN
ARMING CABLE
ARMING CABLE HOUSING
SHEAR PIN
SNAP LOCK PIN
RECEIVER AND BARREL ASSEMBLY
SAFETY RETAINER RELEASE
SOCKET
SAFETY WIRE
ALTERNATE ON EARLY MODELS ONLY.........

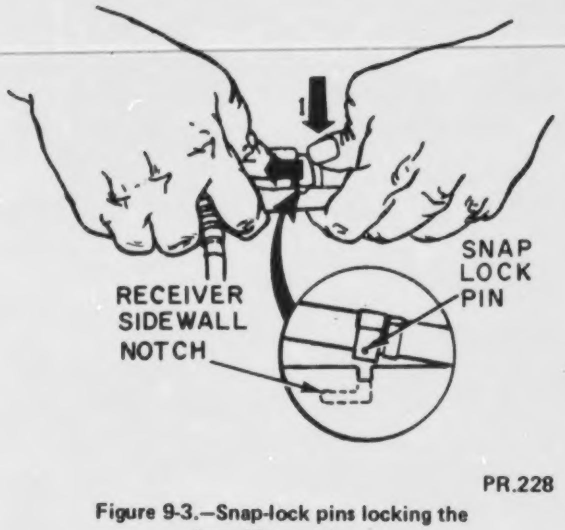
PR.266

Figure 9-1.–Model 7000 automatic actuator.



PR.227

Figure 9-2.—Disengaging barrel snap-lock for access to cartridge.



PR.228

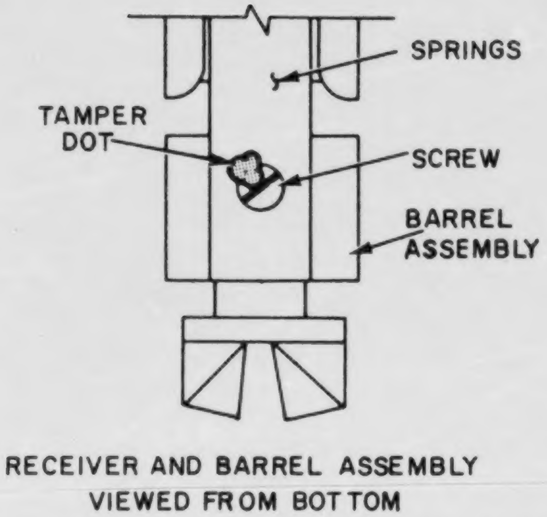
Figure 9-3.—Snap-lock pins locking the barrel in position.

1. Cover and power cable housing assembly. Inspect for security, attachment, and for presence of the plug in the end of the power cable tube.
2. Power cable. Inspect for freedom of movement, security of attached swaged ball, and security of the power cable eye.
3. Receiver and barrel assembly. Examine for any discrepancy conducive to malfunctions.
4. Hammer firing pin. Inspect for flattening and looseness.
5. Army pin. Examine for security when inserted in the retainer, while the barrel is unlocked. The pin, while securely held, must be capable of manual removal by a pull not to exceed 10 to 20 pounds.
6. Socket. Inspect for socket and piston retention by the shear pin or lockwire. (Lockwire was used on early models.)
7. Snap-lock pins. Check for damage.
8. Leaf springs. Inspect for damage and check retaining screw for presence of a tamper dot on the screw and spring. (See fig. 9-4.)
9. Sealing compound on the aneroid screw. Inspect for presence and condition.
10. Gasket seal, located inside the barrel. Inspect for presence and verify that it is positioned with its cup side toward the piston.
11. Serial numbers. They must match; check for possible deviation.

To inspect the arming cable and housing after disarming the actuator, remove the cable from the arming cable housing by pulling the terminal end fitting.

Inspect the cable for evidence of kinks, broken strands, corrosion, and for security of the arming pin and swage ball. Inspect the end fitting spring clip for distortion and other damages; check the plastic knob, if there is one installed.

Any automatic actuator in service must be inspected each time its parachute assembly is repacked. Careful attention and close supervision are required when work is performed on an actuator. Operation of the actuator is a critical function of a parachute assembly and any carelessness or misunderstanding in inspection or assembly can easily result in failure of an assembly. Supervisors must impress upon both riggers and quality assurance inspectors the importance



PR.229

Figure 9-4.–Location of tamper dot.

of careful work. After any modification, the actuator must be reinspected

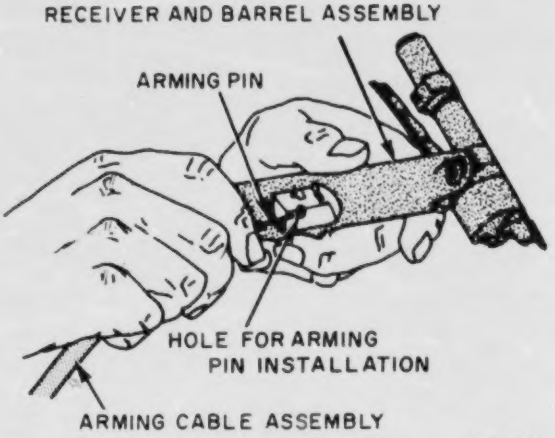
Arming and Assembly

After the complete inspection has been performed and CDI verification is completed at all required steps, the actuator may be assembled, but only as the parachute assembly is packed. Select the proper altitude actuator for the applicable parachute and proceed as follows:

1. Reeve the arming cable housing through the hole in the side of the actuator pocket and through the hole inside the parachute container.
2. Feed the arming cable through the arming cable housing and affix the terminal end fitting to the housing end.

NOTE: The parachute application dictates the side of the receiver and barrel assembly into which the arming cable is inserted; either side, as necessary, may be used.

3. Install the arming pin in the actuator by holding the actuator in the open position and pressing the pin through the hole in the side of the receiver, through the firing mechanism lock, and out through the hole in the opposite side of the receiver. (See fig. 9-5.)


RECEIVER AND BARREL ASSEMBLY
ARMING PIN
HOLE FOR ARMING PIN INSTALLATION
ARMING CABLE ASSEMBLY

PR.230

Figure 9-5.–Installing the arming pin.

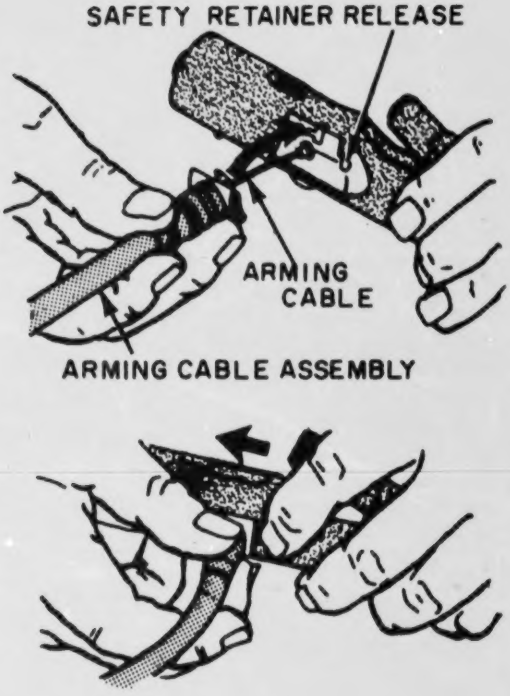
4. Connect the arming cable housing to the receiver and barrel assembly, insuring that the safety retainer secures the housing to the receiver. (See fig. 9-6.)

As a safety measure, complete arming and installation of the actuator are mandatory from this point.

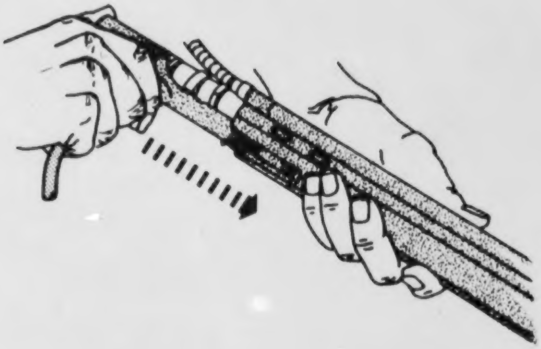
5. Ascertain which time delay cartridge is to be used and insert it into the barrel.
6. Press the barrel downward into position in the receiver. As the barrel reaches the correct position, exert forward pressure on the snap-lock; this causes the snap-lock pins to lock the barrel into position. (See fig. 9-3.)
7. Holding the actuator as shown in figure 9-7, slide the receiver and barrel assembly into the cover and power cable assembly until the screw holes are alined.
8. Install the locking screw and lockwasher and apply a tamper dot to the locking screw, using lacquer. (See fig. 9-8.)

Record appropriate historical data on the Parachute History Card. Items involving the cartridge that must be recorded include the following:

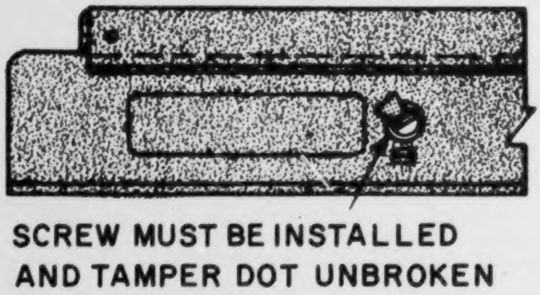
1. Time delay.
2. Installation date.
3. Expiration date.
4. Load lot number.
5. Modifications.


SAFETY RETAINER RELEASE
ARMING CABLE
ARMING CABLE ASSEMBLY

PR.231
Figure 9-6.—Connection of the arming cable housing.



PR.232
Figure 9-7.—Mating the receiver and barrel assembly to the cover and power cable assembly.

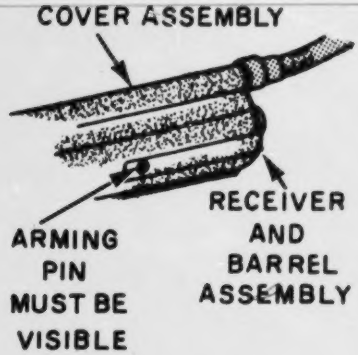

SCREW MUST BE INSTALLED
AND TAMPER DOT UNBROKEN

PR.233
Figure 9-8.—Application of tamper dot to locking screw.

Armed Actuator Check

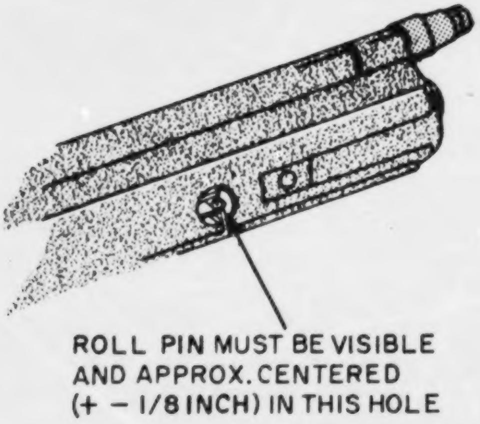
The armed Model 7000 actuator requires a visual inspection as described in the following paragraphs.

Inspect the arming cable installation, the arming pin must be visible in the hole, as shown in figure 9-9.


COVER ASSEMBLY
RECEIVER AND BARREL ASSEMBLY
ARMING PIN MUST BE VISIBLE

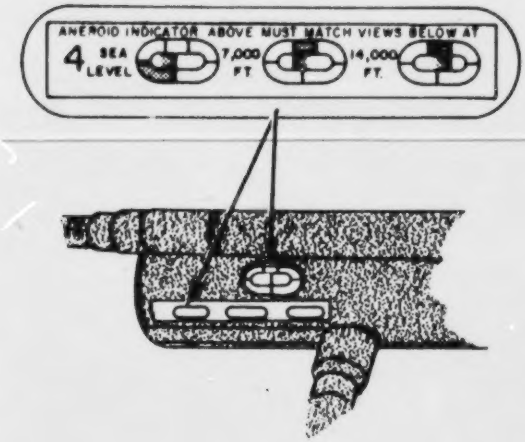
PR.234
Figure 9-9.—Arming pin visual inspection.

Inspect for correct positioning of the spring and for centering of the roll pin in the hole, as shown in figure 9-10.


ROLL PIN MUST BE VISIBLE
AND APPROX. CENTERED
(+ – 1/8 INCH) IN THIS HOLE

PR.235

Figure 9-10.—Roll pin visual inspection.


ANEROID INDICATOR ABOVE MUST MATCH VIEWS BELOW AT
4
SEA LEVEL
7,000 FT.
14,000 FT.

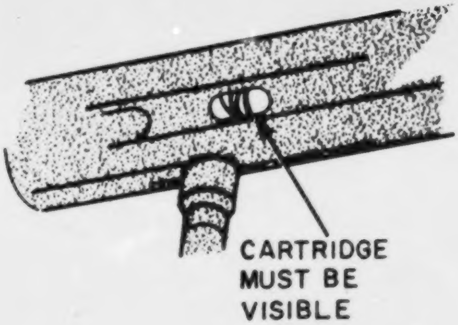
PR.236

Figure 9-11.—Aneroid positioning check.

Check for installation of the locking screw and for an unbroken tamper dot.

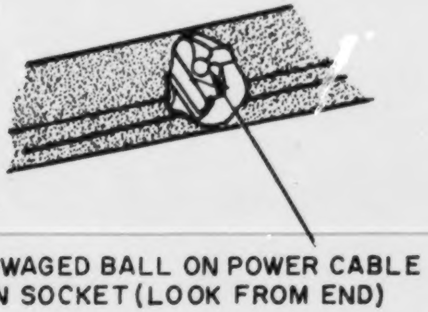
Inspect the aneroid for proper positioning, as shown in figure 9-11.

Verify that the cartridge is installed by looking through the port, as illustrated in figure 9-12.


CARTRIDGE
MUST BE
VISIBLE

PR.237

Figure 9-12.—Cartridge installation visual check.


SWAGED BALL ON POWER CABLE
IN SOCKET (LOOK FROM END)

PR.238

Figure 9-13.—Swaged ball and socket inspection.

Insure that the power cable swage ball is positioned in the socket. (See fig. 9-13.)

MAINTENANCE

Currently all maintenance on the Model 7000 automatic actuator is limited to replacement of the entire unit. Cleaning of the actuator can be accomplished by using a lint-free cloth.

MODELS 1000-D, 1000-F, AND 153-100

Models 1000-D, 1000-F, and 153-100 automatic actuators are currently approved for service use; however, a phasing out program is in progress.

As stated earlier, the Model 7000 is expected to replace all other actuators.

Figures 9-14 and 9-15 illustrate the Models 1000-D, -F, and 153-100 actuators.

Functions for these models are the same as those described for the Model 7000. Inspection methods and maintenance procedures are different and will be discussed in the following sections.

INSPECTION

NOTE: If any damage or discrepancy is found, the actuator must have a tag affixed stating that the actuator is not to be used. Remove this tag only after corrections have been made.

To inspect the automatic actuator, proceed as follows:

1. Remove the cartridge from the actuator, if installed. If the actuator has been fired, it must be removed from service.
2. Inspect the hammer and lock. If the sear is in the full forward position, locking the hammer at sea level, the receiver has a defective aneroid. (See fig. 9-16.)
3. Inspect the receiver body of the actuator for dents, corrosion, and distortion. Inspect the interior parts for freedom of movement, corrosion, proper attachment, and distortion.
4. Inspect the spring guide ramp for correct positioning over the hammer roll pin and security of attachment. (See fig. 9-17.)
5. Inspect the cover assembly as follows:
    a. Check the metal housing for bends, dents, sharp edges, and corrosion.
    b. Inspect the power cable tube for dents, security of the power cable locking ring, and presence of plug in the end.
    c. Examine the power cable housing and cable for signs of corrosion, breaks, permanent bends, and security of swaged fittings.
    d. Check the swaged ball on the end of the power cable. The ball must be inside the main housing and not in the power cable tube.
6. Inspect the barrel and piston assembly for proper installation. All springs must curve away from the barrel and the smallest spring will be nearest the barrel.
7. Examine the safety wire on the barrel for proper size and type (0.032 inch, soft copper wire), installation, and security.

NOTE: Broken safety wire may indicate that the actuator has been fired. Inspect the actuator for powder stains on the springs and the bottom of the barrel. If the actuator has fired, remove it from service.

8. Inspect the arming cable and housing for corrosion, breaks, and permanent bends; and the swaged fittings for security. Inspect the terminal end fittings for damage.

For proper lengths of the arming cables and housings, refer to the applicable parachute chapters of the Air-Crew Systems Manual, Parachutes, NavAir 13-1-6.2.

Collateral Duty Inspection (CDI) steps are indicated on the applicable parachute assembly Shop Process Cards. Each CDI step must be complied with before any further work is allowed.

Firing Altitude Check

Automatic actuators used in T-2, T-28, T-34, and A-5 series aircraft must be set to fire at 10,000 (±500) feet above MSL. All other actuators must be set to fire at 14,000 (±500) feet above MSL; they must also be stenciled either 10,000 Ft or 14,000 Ft on the end of the aneroid.

1000 Series actuators may have their firing altitudes reset. The procedures for resetting firing altitudes will be discussed later in this chapter.

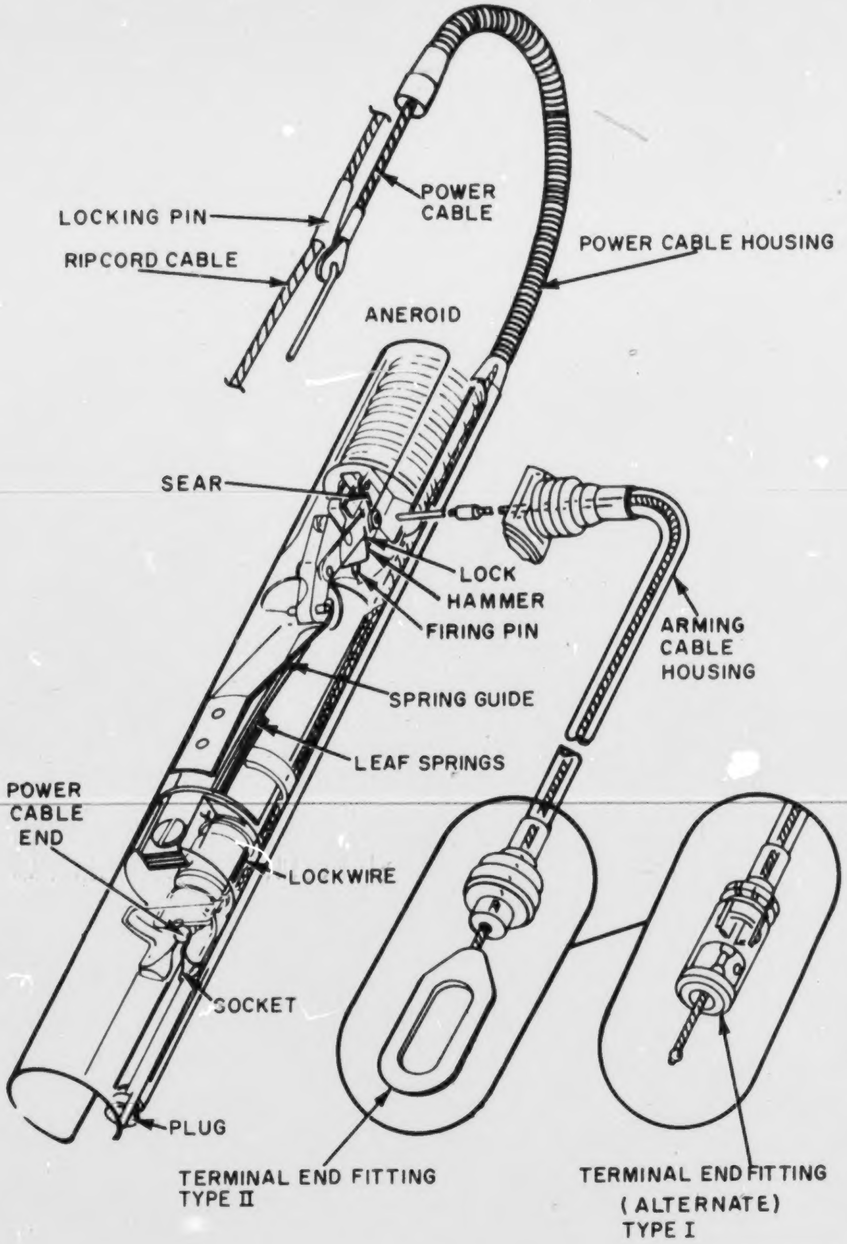
Each time the cartridge is replaced in an actuator due to service life expiration, the actuator must be tested to verify its firing altitude.

Types of testing equipment such as test chambers and substitute arming pins will be dictated by the local facility.

Never allow an actuator to fire without a dummy test cartridge being installed, as this will cause firewall distortion.

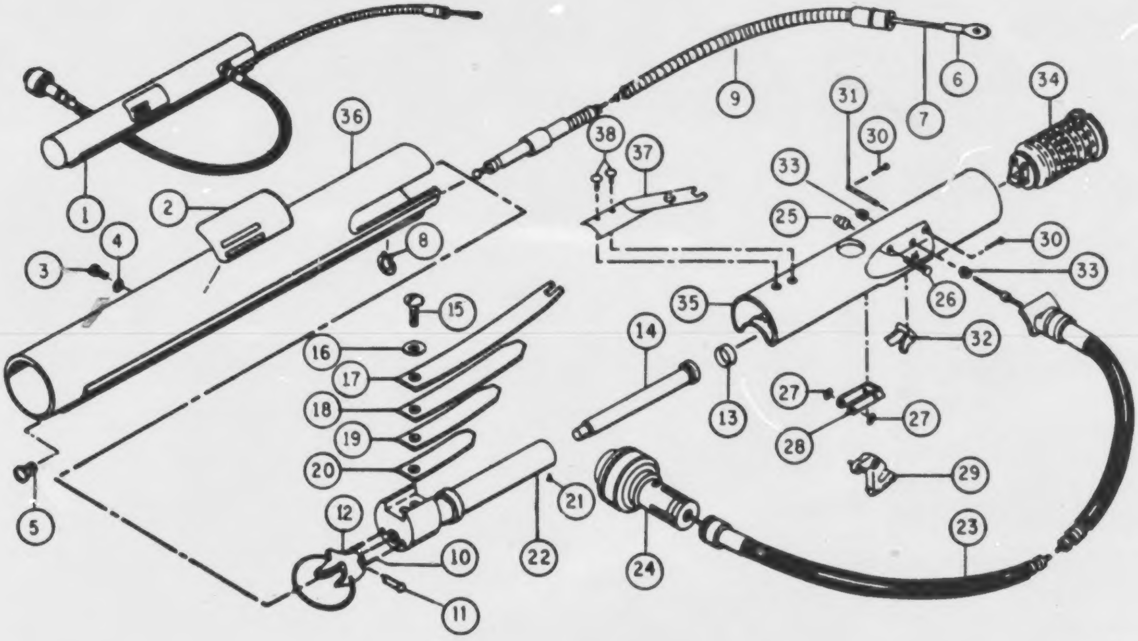
To verify the firing altitude, proceed as follows:

1. Arm the actuator with a dummy test cartridge and install the substitute arming pin.
2. Place a hose clamp over the barrel and receiver assembly and tighten until the barrel is flush with the receiver. (See fig. 9-18.)
3. Install the actuator in the altitude chamber and evacuate to 16,000 feet above MSL. Remove the substitute arming pin.


LOCKING PIN
POWER CABLE
RIPCORD CABLE
POWER CABLE HOUSING
ANEROID
SEAR
LOCK
HAMMER
FIRING PIN
ARMING CABLE HOUSING
SPRING GUIDE
LEAF SPRINGS
POWER CABLE END
LOCKWIRE
SOCKET
PLUG
TERMINAL END FITTING TYPE II
TERMINAL END FITTING (ALTERNATE) TYPE I

PR.239

Figure 9-14.–Automatic actuator (cutaway view).



PR.240

1. Automatic actuator assembly.
2. Nameplate.
3. Screw.
4. Washer.
5. Plug.
6. Swage fitting.
7. Cable and eye assembly.
8. Ring, snap.
9. Cable housing assembly.
10. Wire, tie.
11. Rivet.
12. Socket (shovel).
13. Gasket (seal).
14. Piston
15. Screw.
16. Washer.
17. Spring
18. Spring.
19. Spring.
20. Spring.
21. Rivet.
22. Barrel.
23. Housing assembly (arming).
24. Arming knob assembly.
25. Pivot screw.
26. Threaded sleeve.
27. Spacer.
28. Lock.
29. Hammer assembly.
30. Pin, cotter.
31. Pin, pivot.
32. Latch.
33. Retainer.
34. Aneroid assembly.
35. Receiver.
36. Cover assembly.
37. Spring guide.
38. Rivet.

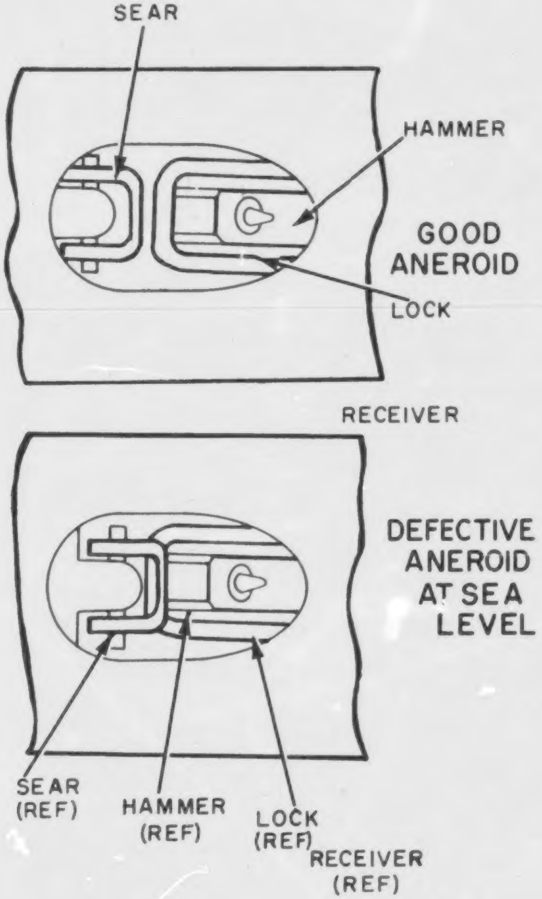
Figure 9-15.—Automatic actuator (exploded view).

4. Decrease the chamber altitude at a rate of 200 feet per second. The actuator must fire at either 10,000 (±500) or 14,000 (±500) feet above MSL, depending on the altitude setting. Remove and inspect the dummy cartridge for an indent caused by contact with the hammer firing pin; the indent must be present. The cartridge is no longer serviceable and must be discarded.

If any defects are noted, tag the actuator and forward it to Supply for screening.

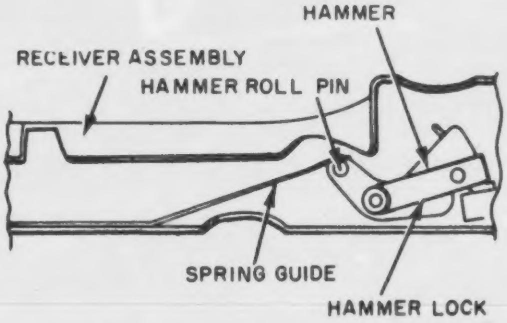
The automatic actuator can now be assembled, but only as the parachute assembly is packed. For assembly of the actuator, proceed as follows:

1. Reeve the arming cable housing through the hole in the side of the actuator pocket and the hole in the side of the parachute container.

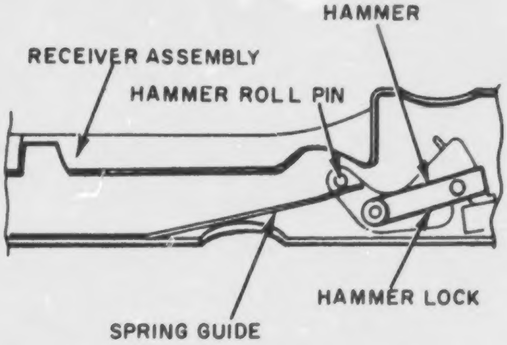

SEAR
HAMMER
GOOD ANEROID
LOCK
RECEIVER
DEFECTIVE ANEROID AT SEA LEVEL
SEAR (REF)
HAMMER (REF)
LOCK (REF)
RECEIVER (REF)

PR.241

Figure 9-16.–Hammer and lock and sear position check.


HAMMER
RECEIVER ASSEMBLY
HAMMER ROLL PIN
SPRING GUIDE
HAMMER LOCK

CORRECT FOR 1000C (MOD) 1000E, 1000D, AND 155-100 AUTOMATIC ACTUATORS


HAMMER
RECEIVER ASSEMBLY
HAMMER ROLL PIN
HAMMER LOCK
SPRING GUIDE

CORRECT FOR 7000 AUTOMATIC ACTUATOR

PR.242

Figure 9-17.–Spring guide ramp and hammer roll position check.

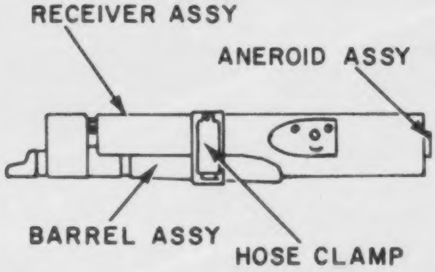
2. Feed the arming cable and pin through the arming cable housing and clip the terminal end fitting to the housing end. Do not install the slide cover. The arming cable may be inserted on either side of the receiver, depending on the parachute application.

3. Insert the arming pin through the guide hold in the receiver and through the holes in the hammer lock, as shown in figure 9-19.

The arming pin must be fully inserted. Press down on the hammer roll pin and the spring guide ramp, visible through the inspection hole in front of the firewall. The hammer should remain in the cocked position; if it does not, remove the pin and repeat the above step.

4. Engage the fork end of the longest barrel assembly spring on the hammer assembly. The leaf spring must be on top of the hammer roll pin. Engage the shoulder of the barrel into the slot in the receiver. (See fig. 9-20.) Use only the proper length barrel assembly. Barrels are not interchangeable between models.

5. Press the barrel down flush with the receiver, insuring that the barrel assembly extends close enough to the receiver firewall to allow the firing pin to actuate the cartridge when released. The accepted distance is 3/32 (+0 -1/32) inch.


RECEIVER ASSY
ANEROID ASSY
BARREL ASSY
HOSE CLAMP

PR.316

Figure 9-18.—Hose clamp affixed to the barrel and receiver assembly.

6. Insure that a plastic gasket is inserted into the barrel with the flat side toward the cartridge end. (See fig. 9-20.)

WARNING: As a safety measure to protect personnel and equipment, complete arming and installation is mandatory from this point on. The service life of the cartridge is 5 years from the date of manufacturer or 18 months after opening of the original package, whichever occurs first. Service life of the cartridge must not expire before the next scheduled repack of the parachute assembly.

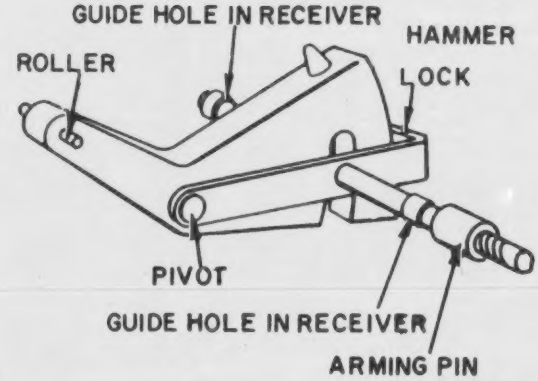
7. Insert the proper time delay cartridge in the barrel. For more detailed information relating to time delay cartridges and their applications, refer to chapter 3 of the Air-Crew Systems Manual, Personnel Parachutes, NavAir 13-1-6.2.

8. Slide the receiver and the barrel and piston into the cover assembly, inserting the screw in the side of the actuator assembly. Engage the swaged ball of the power cable into the socket. (See fig. 9-21.)

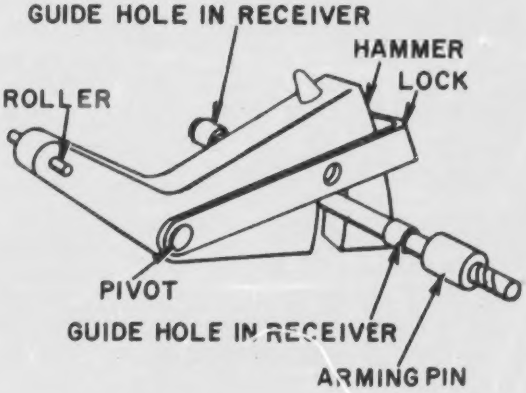
NOTE: Collateral duty inspection (CDI) steps are indicated at various points throughout the actuator inspection; refer to the Shop Process Cards. All work must stop at each of these inspection steps; progress may be continued only after inspection of each CDI step.

Record appropriate historical data on the Parachute History Card. Items involving the time delay cartridge that must be recorded include the following:

1. Time delay.
2. Installation date.


GUIDE HOLE IN RECEIVER
HAMMER
ROLLER
LOCK
PIVOT
GUIDE HOLE IN RECEIVER
ARMING PIN

CORRECT


GUIDE HOLE IN RECEIVER
HAMMER
LOCK
ROLLER
PIVOT
GUIDE HOLE IN RECEIVER
ARMING PIN

INCORRECT

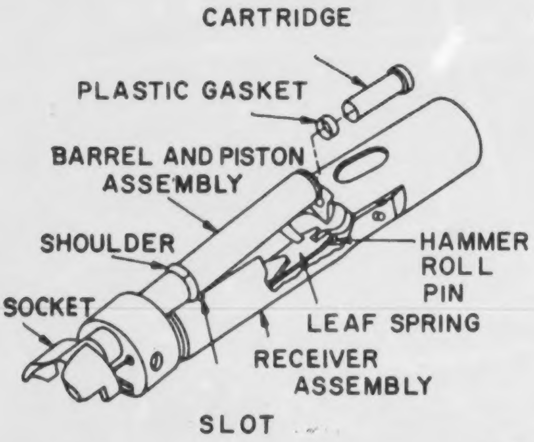
PR.317

Figure 9-19.—Arming pin installation.

3. Expiration date
4. Load lot number
5. Modifications.

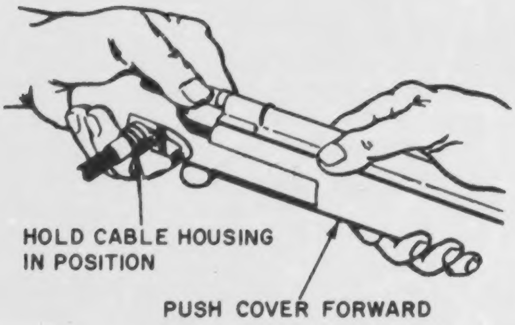
Resetting the Operating Altitude

Resetting the aneroid adjusting screw is a modification that provides the method for raising the operating altitude of the automatic 1000 series actuator from 10,000 feet above mean sea level to 14,000 feet above mean sealevel.


CARTRIDGE
PLASTIC GASKET
BARREL AND PISTON ASSEMBLY
SHOULDER
SOCKET
HAMMER ROLL PIN
LEAF SPRING
RECEIVER ASSEMBLY
SLOT

PR.318

Figure 9-20.–Assembly of the automatic actuator.


HOLD CABLE HOUSING IN POSITION
PUSH COVER FORWARD

PR.320

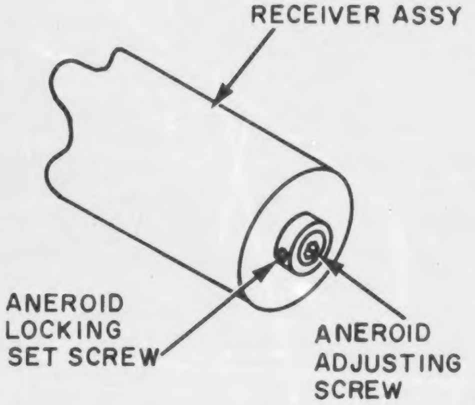
Figure 9-21.–Cover assembly detail.

This modification is applicable to and must be performed on all actuators except Model 7000 and those used in T-2, T-28, T-34 and A-5 series aircraft, unless the actuators were manufactured with a 14,000-foot setting.

If a walk-in type altitude chamber is available, the altitude setting of these actuators can be changed to the correct altitude setting by the procedures discussed in the following paragraphs.

Remove the receiver assembly from the cover assembly of the actuator. Then remove the barrel and piston assembly from the receiver assembly and remove the explosive cartridge. Do not remove the arming pin. Install a dummy test cartridge in the barrel and replace the barrel and piston in the receiver assembly. Place a hose clamp around the barrel and tighten it until the barrel lies flush with the receiver, as shown in figure 9-18. Prior to removing the aneroid sealing compound, it is advisable at this point to perform an actuator operating altitude check. It is possible that the actuator was previously adjusted to 14,000 ± 500 feet, but not properly marked. If the actuator operating altitude test confirms a 10,000-foot setting, remove the sealing compound from the end of the aneroid assembly using an awl; this will expose the aneroid adjusting screw.

Take the receiver assembly and barrel into the altitude chamber, evacuate the chamber to 14,000 feet, and level off. Remove the arming pin from the assembly. Loosen the small setscrew on the side of the aneroid adjusting screw (fig. 9-22).


RECEIVER ASSY
ANEROID LOCKING SET SCREW
ANEROID ADJUSTING SCREW

PR.246

Figure 9-22.–Receiver assembly detail.

Slowly turn the aneroid adjusting screw clockwise until the aneroid assembly is retracted far enough to release the lock from the sear and permit the hammer assembly to strike the dummy test cartridge. Tighten the locking setscrew at this setting. (NOTE: Never allow the unit to fire unless it is loaded with a dummy test cartridge.)

Remove the hose clamp and place the hammer assembly in the armed and cocked position and insert the arming pin through the retaining holes in the receiver. Place the hose clamp around the barrel and tighten until the barrel lies flush with the receiver.

Evacuate the chamber to 16,000 feet and remove the arming pin. Decrease chamber altitude at a rate of approximately 200 feet per second. Record the altitude at which the aneroid assembly releases the lock and permits the hammer to strike the dummy test cartridge. Repeat the steps above; recorded altitudes for both runs must be 14,000 ± 500 feet.

When two consecutive altitude firing tests are within 14,000 ± 500 feet, insure that the aneroid locking setscrew is tight. Fill the aneroid adjusting screw area with auto body filler and paint the filler with red lacquer. Stencil "14,000 Ft" on the end of the aneroid cover on the receiver.

Parachutes having automatic actuators installed with the 14,000-foot altitude setting will have a notation recorded on the Parachute History Card.

Remove the hose clamp and dummy test cartridge.

To reset operating altitude when using a bench type altitude chamber, proceed as follows:

1. Remove the receiver from the cover assembly.
2. Remove the barrel and piston from the receiver and remove the explosive cartridge. Remove the arming pin and replace it with a substitute arming pin.
3. Install a dummy test cartridge and replace the barrel and piston in the receiver.
4. Place a hose clamp around the barrel and tighten until the barrel lies flush with the receiver.
5. Remove the sealing compound from the end of the aneroid by using an awl. This will expose the aneroid adjusting screw.
6. Loosen the locking setscrew on the side of the aneroid adjusting screw (fig. 9-22).
7. Turn the aneroid adjusting screw clockwise, retracting the aneroid; tighten the locking screw, but do not use force.

NOTE: Resetting the altitude is a matter of trial and error until the final setting is obtained. After each test in the chamber, adjustment of the aneroid adjusting screw may be necessary. Turning the aneroid adjusting screw clockwise raises the release altitude; counterclockwise lowers the release altitude.

8. Install the assembled receiver and aneroid in the altitude chamber after cocking the firing mechanism and securing it with a substitute arming pin.
9. Install the test chamber glass, close the bleed valve and evacuate the chamber until 16,000 feet is indicated on the manometer. Close the shutoff valve in the vacuum line.
10. Remove the substitute arming pin from the firing mechanism.
11. Open the bleed valve and allow the chamber to decrease altitude at a rate of approximately 200 feet per second.
12. Observe the action of the firing mechanism and level off the mercury column in the manometer. The actuator must fire at an altitude of 14,000 ± 500 feet above MSL. It may be necessary to recock the unit and repeat the steps listed above.
13. After the actuator has fired at 14,000 ± 500 feet above MSL, repeat the test procedures once again to verify the results.
14. When two consecutive firing tests are within limits, insure that the aneroid locking screw is tight. Fill the aneroid adjusting screw area with auto body filler and paint the filler with red lacquer. Stencil "14,000 Ft" on the end of the aneroid cover on the receiver.
15. Remove the hose clamp and dummy test cartridge. Record completion of the modification in accordance with OpNav 4790.2 and make notation on the Parachute History Card.

CHAPTER 10

PERSONNEL PARACHUTE MAINTENANCE AND REPAIR

Materials used in parachute construction are of the very best grade obtainable. All of these materials–the fabric, webbings, cords, tapes, hardware, and fasteners–are manufactured in accordance with strict government specifications.

A specification is a document intended primarily for use in procurement, which clearly and accurately describes the essential and technical requirements for items, materials, or services, including the procedures by which it will be determined that the requirements have been met.

In the case of the Armed Forces, specifications are necessary to insure that the item procured meets all the requirements for which the government is paying and that the item will perform all the necessary functions.

As each item is procured under this program, it is assigned a Military (MIL) Specification number. The MIL specification numbers listed in this chapter are now in effect. However, specifications are revised from time to time, and specification numbers are often changed, canceled, or superseded. The Index, List of Military Specifications and Standards, NA 00-25-544, lists all specifications in effect and those recently canceled. This index is reissued periodically under the supervision of the Naval Air Systems Command and is available in your technical library.

As a PR, you must not tolerate the use of substitutes or substandard materials in the fabrication or repair of survival equipment. A knowledge of specifications and tensile strengths will better equip you to design local projects which must meet specified tensile strength requirements.

The prime authority for all parachute construction, component replacement, and perplexing repairs will be the applicable drawing of the parachute concerned. The drawing numbers of parachute assemblies and particular components may be found in the Master Drawing Index.

Activities servicing parachutes should maintain a file of current parachute drawings, and review any extensive rework for compliance with the drawing.

Parachute assemblies requiring maintenance, repair, modifications or repack will be assigned to the lowest maintenance level capable of performing the work, in accordance with OpNav 4790.2.

TYPES OF MATERIALS

PARACHUTE CANOPY MATERIAL

As previously mentioned, parachute materials are manufactured in accordance with Military Specifications. For example, a nylon parachute cloth used in the construction of some personnel parachutes is made in accordance with Specification MIL-C-7020. This cloth is neutral in color unless otherwise specified, and is used in constructing the gores and pannels of the parachute canopy. The specification states that the maximum weight cannot be more than 1.1 ounces per square yard.

The breaking strength in minimum pounds per inch of width is 42 pounds. The minimum tear resistance is 5 pounds for both the warp and filler thread. The air permeability in cubic feet per minute per square foot of cloth is 80 to 120.

Any nylon repair material fabric, webbing, tape, thread, or cord has a shelf life in accordance with table 10-1. In lieu of a date of manufacture, if none is available, the date of receipt of the material is used. A tag must be attached to the material showing the date of manufacture (or receipt), stock number, military specification

Table 10-1.–Shelf life of parachute material.

Material description	Specification No.	Shelf life (yr)
Cord, nylon	MIL-C-5040	5
Cord, nylon coreless	MIL-C-7515	5
Cloth, parachute	MIL-C-7350	5
Cloth, parachute	MIL-C-8021	5
Cloth, parachute	MIL-C-7020	5
Cloth, parachute	MIL-C-20962	5
Cloth, coated	All	5
Webbing, textile	All	Unlimited
Webbing, nylon	All	Unlimited
Tape, textile	All	Unlimited
Thread, nylon	All	Unlimited
Thread, cotton	All	Unlimited

or standard number, nomenclature, type and class. When materials are used for repairs or modifications, the tag is examined and verified by a collateral duty inspector.

NYLON CORD

Nylon cord used for suspension lines for pilot chutes and parachutes is made in accordance with Specification MIL-C-5040. Type I cord, 100 pounds breaking strength, is used for the lines of Martin-Baker pilot chutes. Type III, 550 pounds breaking strength, is used for constructing the suspension lines of the canopies of service personnel parachutes.

NYLON REINFORCING TAPE

Nylon reinforcing tape is made in accordance with Specification MIL-T-5038. Reinforcing tape comes in many widths and styles. Some of the uses for this tape are parachute container reinforcements, edgings, hesitator loops, and general strengthening of stress areas.

Type II tape is three-fourths of an inch wide and has a minimum breaking strength of 400 pounds. Type IV tape comes in both 1-inch and 1-1/2-inch widths. The 1-inch width has a minimum breaking strength of 1,000 pounds, and is used to reinforce end flaps. The breaking strength of 1-1/2-inch tape is 1,500 pounds. This tape is used to construct hesitator loops and to house phenol fiber stiffeners. Type VI tape is three-fourths of an inch wide and has a breaking strength of 425 pounds.

NYLON WEBBING

Nylon webbing is made in accordance with Specification MIL-W-4088. Type VI nylon webbing is used for the construction of harness keepers, carrying handles on the NC-3 parachute, and reinforcement of corners and chaffing webbing. It has a breaking strength of 1,800 pounds.

Another type of webbing is type VIII. This is used to manufacture the cross-connector straps on the NC-3 parachute. It has a tensile strength of 3,600 pounds.

Type XIII soft textile nylon webbing is used for constructing parachute harness. This webbing has a breaking strength of 6,000 pounds and is olive drab in color. The width of this webbing is 1 23/32 ± 1/16 inch.

Type XVII 1-inch nylon webbing is used for the construction of end tabs. Its breaking strength is 2,400 pounds.

NYLON TUBULAR WEBBING

Nylon tubular webbing is made in accordance with Specification MIL-W-5625. Nylon tubular webbing is neutral in color and is used in reinforcement of the parachute canopies. Nylon tubular webbing is also used in making the pilot chute connector cords. The 1/2-inch tubular webbing has a breaking strength of 1,000 pounds and is used for the pilot chute connector cord on the NB-6, NB-7, NB-7E, NB-8, NB-9, NB-10, NB-11, NC-3, NS-3, and LW-3B parachutes. All MBEU parachutes use 1,500 pound tubular nylon webbing, 9/16-inch wide for making their pilot chute connector cords.

The 1-inch nylon tubular webbing has a breaking strength of 3,000 pounds and is used for the vent reinforcement. The nylon warp and cotton filler webbing is also 1-inch wide and has a breaking strength of 525 pounds. It is used to reinforce the skirt hem.

FABRIC CONTAMINATION INSPECTION AND REMOVAL

Parachute assemblies must be carefully inspected for evidence of contamination. The various types of contamination are acid, alkaline, salt water, fresh water, perspiration, mildew and fungus, fire fighting agents, mud, dirt, and petroleum.

ACID AND ALKALINE

Parachute assemblies suspected of acid or alkaline contamination must be tested with pH test paper. A pH reading of 5.0 to 9.0 is in the safe zone. Readings below 5.0 indicate excess acidity, and readings above 9.0 indicate excess alkalinity.

To test for excess acidity or alkalinity dampen the suspected area with distilled water. NOTE: Handle test paper by one end or edges only to prevent obtaining a false reading.

Place a piece of full range test paper (0.0 to 14.0 pH) on dampened area. A color change will indicate the approximate pH and which specific shortrange test paper to use. Place a piece of shortrange test paper indicated in the above test on the dampened area. The color change indicates the pH factor of the affected area. By matching the test strip with the applicable range color chart supplied with the pH indicator kit, acid or alkaline strength can be determined.

If contamination is found, care must be used to prevent contact between the contaminated area and other portions of the assembly, as this could spread the damage.

If acid contamination is found, the affected parachute assembly must be forwarded to supply for screening.

If alkaline contamination is found, rinse with cool, fresh water until a safe pH reading is attained. Carefully inspect for deteriorated portions, repair or replace any affected areas.

SALT WATER CONTAMINATION

Parachutes that have been contaminated by salt water must be cleaned, inspected, and treated as soon as possible after contamination. Any portion of a parachute assembly which has been immersed in salt water for a period of more than 24 hours must be turned into supply for screening. Any portion of a parachute assembly which has been contaminated by salt water and cannot be cleaned within 36 hours must be turned into supply for screening. Clean any parachute assembly contaminated by salt water as described later in this chapter under the heading, Cleaning Parachute Assemblies.

PERSPIRATION CONTAMINATION

Any parachute assembly which is stained with perspiration must be cleaned as described later in this chapter. After cleaning, the fabric affected must be closely inspected to insure that deterioration has not taken place. Scrap or repair any damaged portion of the parachute assembly.

FRESH WATER CONTAMINATION

Any parachute that has been contaminated by fresh water must be dried as soon as possible. The assembly must then be inspected for signs of stains by oil, hydraulic fluid, mud, etc. Such stains must be removed by cleaning as described later in this chapter under the heading, Cleaning Parachute Assemblies.

MILDEW AND FUNGUS CONTAMINATION

If mildew or fungus is present on a parachute assembly, wash the affected area with a mild soap and water solution. Rinse the affected area thoroughly with clean, fresh water and hang the assembly by vent lines in a wet locker to dry.

FIREFIGHTING AGENTS CONTAMINATION

If a parachute assembly is contaminated with firefighting agents, forward to supply for screening.

PETROLEUM PRODUCTS CONTAMINATION

Oil, grease, hydraulic fluid, and other petroleum stains must be removed by repeated applications of a mild soap and water solution. Each application must be followed by a rinse in clean, fresh water. Hang the assembly by vent lines in a wet locker to dry.

CLEANING PARACHUTE ASSEMBLIES

Cleaning of parachute assemblies should be held to a minimum and done only when necessary to avoid malfunction or deterioration.

Do not scrub fabric with any cleaning implement or against itself, do not brush fabric. Do not pick at or try to break off dried or caked mud. Wrap all metal fittings in heavy flannel cloth.

Hang the parachute assembly by vent lines and thoroughly shake to remove all sand, dust, and mud. If the assembly is wet, immerse it in clean, fresh water not over 120°F. Gently move the parts by hand until all air pockets are removed. Agitate by hand until water flows through and around the fabric. MACHINE AGITATION MUST NOT BE USED.

After 5 to 10 minutes, lift the assembly from the tub and allow to drain as completely as possible. Drain and rinse the tub and refill with water; repeat the 5 to 10 minute wash twice. If the parachute has dried before the first rinse is performed, the first rinse must be preceded by a 2- to 3-hour soaking in a tub filled with clean, cool, fresh water. If a large tube is not available, hang the assembly by the canopy vent lines and spray clean using clean, fresh water not over 120°F.

Do not use a forced-heat dryer. Do not wring water from the canopy.

Place the cleaned parachute assembly into a low speed dryer and spin dry. If a low-speed dryer is not available, hang the parachute assembly by vent lines in a wet locker only until dry. When the assembly is completely dry, remove the flannel cloth from the metal fittings.

If the parachute assembly has stains which cannot be removed by the procedure described in the foregoing paragraphs, it must be forwarded to a depot-level maintenance activity for additional cleaning. Attach a report of the nature and location of stains.

STENCILING PARACHUTE ASSEMBLIES

Parachute assemblies are marked by the manufacturer in accordance with the general specifications for parachutes. When a parachute is placed in service from stores, the month/year of opening the manufacturer's individual shipping container must be stenciled on the canopy nameplate gore. Letters are 1/2 inch high and made with blue parachute marking fluid (MIL-I-6903). The term "date placed into service" followed by month/year notation must be placed directly below the nameplate.

When a replacement parachute harness is installed, the date, preceded by the letter "R," must be stenciled in the center of the horizontal back strap in letters 1/2 inch high.

Service life of integrated torso suit harness is the same as for parachute assemblies. The start-of-service date must be stenciled in the center of the lap belt strap outer surface. Use black washproof ink (MIL-I-6903, Type II).

The date of manufacture and date placed in service for each major component of a parachute should be available. If no date of manufacture is available on a subassembly, the date marked on the parachute canopy is assumed to apply to the subassembly.

Use an appropriate size adjustable metal stencil for all markings on parachute assemblies. Join each letter properly in the grooves provided. When the stencils are joined, aline the letters or figures in order to prevent a wavering line. Use the end plates provided in each kit, which offer the necessary margin to prevent smearing the marking fluid off the ends. Hold each letter down tightly as the fluid is applied with a dampened brush. Do not attempt to stencil with a wet brush as the fluid will run off in all directions. Wipe the back of the stencil clean with a dry cloth between each operation. Before storing, clean the adjustable stencils in a safe cleaning solvent.

When using a rubber stamp and pad, moisten the pad with ink. The pad must be evenly coated and free of clots. Make a test impression first to determine correctness of the marking and inking. When stamping thin or porous cloth, place paper towels behind the area being stamped to prevent smearing or blotching. Allow the marking to dry approximately 20 to 30 minutes.

STITCHES, SEAMS, AND STITCHINGS

Federal Standard No. 751 is the official standard specification used in the manufacture and repair of parachutes, survival equipment, and other items which require the use of stitches, seams, or stitchings. The following information is taken from this specification.

CLASSIFICATION OF STITCHES, SEAMS, AND STITCHINGS

As a prerequisite to an understanding of stitches, seams, and stitchings, a clear understanding of their classification and the terms employed in their use is essential.

Stitches

A stitch is one unit of conformation of thread resulting from repeatedly passing a strand or strands and/or loops of thread into or through a material at uniformly spaced intervals to form a series of stitches.

Stitches are divided into six classes which are identified by the first digit of three-digit numerals. Each class is divided into several types which are identified by the second and third digit. These classes are as follows:

100–Chainstitch
200–Handstitch
300–Lockstitch
400–Multithread chain stitch (double locked stitch)
500–Overedge stitch
600–Flat seam stitch

STITCH CLASS 100.–This class of stitch is formed with one or more needle threads and has for its general characteristic interlooping. A loop or loops of thread or threads must be passed through the material and secured by interlooping with succeeding loop or loops to form a stitch, as shown in figure 10-1. This type of stitch is formed with one needle thread which is passed through the material and interlooped with itself on the undersurface of the material.

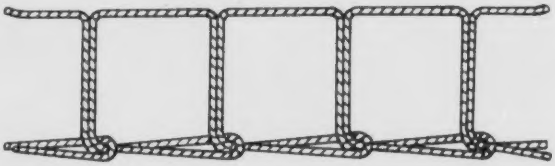


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Figure 10-1.–Stitch type 101.

STITCH CLASS 200.–This class of stitch is formed by hand with one or more needle threads. Each thread passes through the material as a single line of thread, and the stitch is secured by the single line of thread passing in and out of the material or interlooping of the threads with themselves. When more than one thread is used, the threads pass through the same perforations in the material, as illustrated in figure 10-2. This type of stitch is formed with two needle threads (A) and (A') passed through the material in the same perforations from opposite directions without interlacing or interlooping.

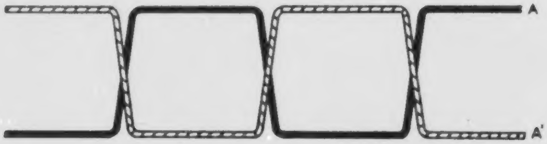

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Figure 10-2.–Stitch type 201.

STITCH CLASS 300.–This class of stitch is formed with two or more groups of threads and has for a general characteristic the interlacing of the two groups. Loops of the first group of threads are passed through the material where they are secured by the thread or threads of the second group to form a stitch. This is the most common type of stitch in use in repair and maintenance of parachutes and other survival equipment. It is made by machine and is illustrated in figure 10-3. This type of stitch is made with two threads: one needle thread (A) and one bobbin thread (B). One loop of thread A is passed through the material and interlaced with thread B. Thread A is pulled back so that the interlacing is midway between the surfaces of material being sewn.

STITCH CLASS 400.–This class of stitch is formed with two or more groups of threads and has for a general characteristic the interlacing and interlooping of the loops of the two groups. Loops of the first group of threads are passed

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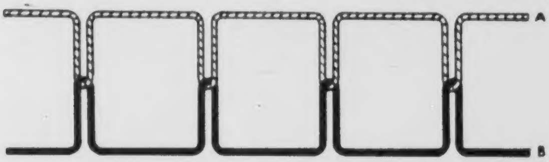

Figure 10-3.—Stitch type 301.

through the material and are secured by interlacing and interlooping with loops of the second group to form a stitch.

STITCH CLASS 500.—This class of stitch is formed with one or more groups of thread, and loops from at least one group of thread are passed around the edge of the material. Loops of one group are passed through the material and are secured by interlooping with themselves before succeeding loops are passed through the material, or secured by interlooping with loops of one or more interlooped groups of threads before succeeding loops of the first group are passed through again.

STITCH CLASS 600.—This class of stitch is formed with two or more groups of threads, and two or more groups cover the raw edges of both surfaces of the material. Loops of the first group of threads are passed through loops of the third group already cast on the surface of the material and then through the material where they are interlooped with loops of the second group on the underside of the material. The one exception to this procedure is stitch type 601. In this type only two groups of thread are used and the function of the third group is performed by the threads of the first group.

Seams

A seam is a joint consisting of a sequence of stitches uniting two or more pieces of material and is used for assembling parts in the production of sewn items. Seams are divided into four classes:

SS—Superposed seam (Superimposed)
LS—Lapped seam
BB—Bound seam (Binding)
FS—Flat seam

Seams are further subdivided into types, designated by a system of lowercase letters which indicate the type of the class. These types run consecutively through the alphabet; however, since there are many variations of seams and only 26 letters in the alphabet, multiple lowercase letters must also be used; for example, a, b, c, aa, ab, etc.

Most seam types can be produced using either one row or multiple rows of stitches. The number of rows of stitches is indicated by an arabic numeral preceded by a dash; thus, the complete symbol for a simple superposed seam formed with standard stitch type 301 and one row of stitches is specified 301-SSa-1.

SEAM CLASS SS.—In this class of seam the plies of material are superposed and sewn with one or more rows of stitches.

SEAM CLASS BS.—This class of seam is formed by folding a binding strip over the edge of one or more plies of fabric and seaming the strip to the material with one or more rows of stitches.

SEAM CLASS LS.—In this class of seam the plies of material are lapped and seamed with one or more rows of stitches.

SEAM CLASS FS.—This class of seam is formed by seaming the abutted edges of the material together in such a manner that the stitches extend across and cover or tend to cover the edges of the plies joined.

Typical examples of these seams are illustrated in figure 10-4. A careful study of these examples will give the reader an idea of the basic seams and stitchings used in the repair of survival equipment. However, when a specific seam is called for in a drawing or a specification, reference should be made to Federal Standard 751 for the specifications for the seam or stitching to be used.

Stitchings

Stitching consists of a sequence of stitches for finishing an edge or for ornamental purposes (or both) in preparing parts for assembly. Stitchings are divided into two classes as follows:

OS—Ornamental.
EF—Edge finishing.

These stitchings are illustrated in figure 10-5. Note the difference between these stitchings and

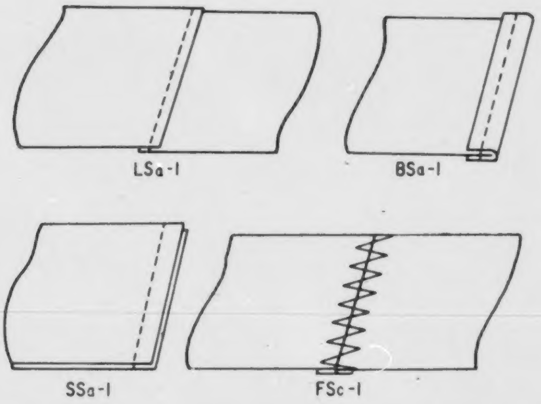

Figure 10-4.–Classes of seams.

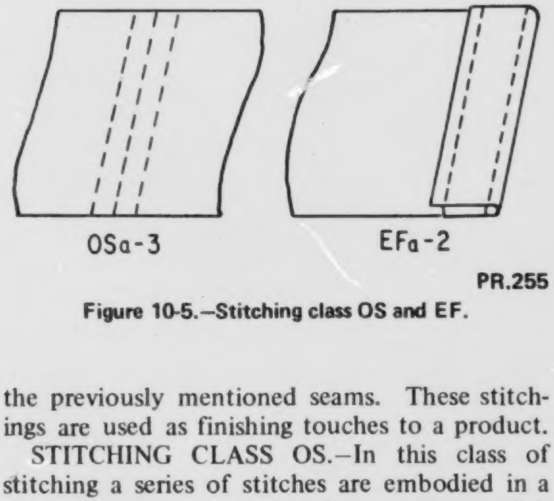

Figure 10-5.–Stitching class OS and EF.

the previously mentioned seams. These stitchings are used as finishing touches to a product.

STITCHING CLASS OS.–In this class of stitching a series of stitches are embodied in a material either in a straight line, a curve, or following a design, for ornamental purposes.

STITCHING CLASS EF.–In this class of stitching edge, finishing is accomplished by either (1) stitching a series of stitches at or over the edge of a material (the edge may or may not be folded as specified), or (2) the edge of the material is folded and stitched to the body of the material with a series of stitches.

CHARACTERISTICS OF SEAMS AND STITCHINGS

A properly constructed seam or stitching must have strength, elasticity, durability, security, and a neat appearance. These characteristics must be balanced with the properties of the material to be joined to form the optimum seam. The end use of the item will govern the relative importance of these characteristics, and the selection of the seam or stitching type should be based upon these considerations.

Strength

The strength of a seam or stitching should equal that of the material it joins in order to have balanced construction that will withstand the forces encountered in the use of the item of which the seam is a part. The elements affecting the strength of a seam or stitching are as follows:

Stitch type.
Thread strength.
Stitches per inch.
Thread tension.
Seam or stitching type.
Seam efficiency of the material.

Elasticity

The elasticity of a seam or stitching should be slightly greater than that of the material which it joins, so that the material will support its share of the forces encountered in the end use of the sewn item. The elasticity of a seam or stitching depends upon the following:

Stitch type.
Thread elasticity.

Durability

The durability of a seam or stitching depends largely upon its strength and the relation between the elasticity of the seam and the elasticity of the material. However, in the less elastic, tightly woven, dense materials there is a tendency for the plies to "work" or slide on each other. To form a durable seam or stitching in such materials, the thread size must be judiciously chosen and the stitches well set to the material (without undue tension which will unbalance the elasticity and cause puckering) to minimize abrasion and wear by contact with outside agencies.

Security

The security of a seam or stitching depends chiefly upon the stitch type and its susceptibility to become unraveled. The stitch must be well set to the material to prevent snagging which can cause rupture of the thread and unraveling of certain stitch types.

Appearance

The appearance of a seam or stitching generally is governed by the proper relationship between the size and type of thread, the length of stitch or number of stitches per inch, and the texture and weight of the fabric. In addition to this relationship, the technique and skill of the sewing machine operator also governs the appearance of the seams and stitchings.

Some of the factors which adversely affect the appearance of seams and stitchings are listed below.

- Defects in stitchings:
  - Loose stitches.
  - Poorly formed stitches.
  - Crowded stitches.
  - Tight stitches.
  - Crooked stitches.
  - Skipped stitches.
- Defects in seams and stitching:
  - Puckers.
  - Twists.
  - Pleats.
  - Raised seams (runoffs).
  - Felled seams (raw edges exposed).

PATCHING THE PARACHUTE CANOPY

A canopy is considered beyond repair if one or both of the following conditions exists: One or more complete gores are torn or there are holes larger than 8-inches long in four or more sections. If damaged beyond repair, the canopy should be forwarded to a supply activity for screening. Any section with holes, tears, or cuts larger than 8 inches must be replaced in accordance with drawings and specifications.

Only two single patches or one double patch may be installed on a single section. If additional patches are required, replace the section. Any hole, cut, or tear 1 inch square or less may be patched with a single patch. A severe separation or a separation with broken threads must be patched using a single reinforcement patch. Holes larger than 1 inch must be repaired using a double patch, one on the inside and one on the outside of the section. The patch on the inside must be applied first.

If a thread separation is not severe and no threads are broken, the thread can be pressed into place using a soft brush or a pencil eraser. Do not brush the damaged area in the wrong direction as this will cause the separation to increase.

SINGLE PATCHING

Single patches are sewn to the inside of a canopy. A hole or tear less than 1 inch square or a thread separation must be repaired with a single patch.

Salvaged or overaged material must not be used to repair a canopy; all repair materials must have a shelf life of 5 years from date of manufacture.

If a cut or tear is not ragged and no canopy material is missing, baseball stitch the cut or tear. Lock the first and last stitch with an overhand knot. Figure 10-6 shows the method of baseball stitching.

If a cut, tear, or hole has canopy material missing, trim the edges and cut a filler patch the same size and shape as the cut, tear, or hole. Baseball stitch the filler patch in the hole, locking the first and last stitch. (See fig. 10-7.)

To obtain the measurements of the patching material, outline a damaged area using a soft lead pencil. Outline a minimum margin of one inch around a 1- to 3-inch hole; 1-1/2 inches around a 3- to 6-inch hole; and 2 inches around a 6- to 8-inch hole. If possible, anchor the patch to at least one seam or hem.

Place a piece of new material over the outlined area so that the weave of new material matches the weave of the canopy. Cut the patch 1 inch larger than the outlined area.

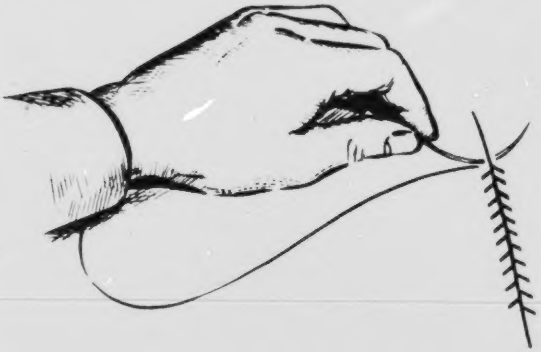

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Figure 10-6.–Baseball stitching a tear.

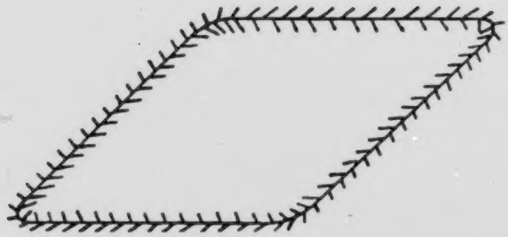

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Figure 10-7.–Filler patch applied with baseball stitch.

Place the damaged area with the inside of the canopy facing up on a padded table. Pin the damaged area flat to eliminate wrinkles and baste the patch to the outlined area. Turn the raw edges of the patch under 1/2 inch. Lockstitch the patch using two rows of stitching around the edges of the patch with 8 to 10 stitches per inch; stitching around the edges of a patch must be continuous. Upon completion of a row of stitches, backstitch 2-1/2 inches on radial seams or hems and 1-1/4 inches on diagonal seams. If the patch is not anchored on a seam or hem, backstitch 1-1/4 inches. (See fig. 10-8.)

For all sewing of patches and other repair work on personnel parachute canopies, size E nylon thread must be used.

DOUBLE PATCHING

A hole, tear, or cut in the canopy greater than one inch square and less than 8 inches square must be patched with a double patch.

Use the same method for baseball stitching and applying filler patches as described for single patching. In order to measure and cut the outside patch, use the inside patch as a gage.

Place the inside patch on a piece of new material and cut the outside patch 1/4 inch larger on all sides except the side or sides that will be anchored to a seam or hem. Sides to be anchored to a seam or hem are cut to the same size as the inside patch.

The inside patch should be the smaller patch and must be applied first, so that its stitching will be covered by the outside patch.

Pin the outside patch to the canopy material, with the outside of the canopy facing up. Sew with size E nylon thread, 8 to 10 stitches per inch, using two rows of stitchings. For additional strength always try to anchor one or more sides of the patch to a seam or hem. NEVER sew through a suspension line. Figure 10-9 shows the method of double patching.

REPLACING PARACHUTE COMPONENTS

VENT RING

Broken or damaged vent rings cannot be repaired and must be replaced.

Open the seam holding the vent ring, remove the damaged vent ring and insert the new ring. Resew the hem using size E nylon thread, 8 to 10 stitches per inch. When the seam is completed, backstitch 1-1/4 inch.

HARNESS/RISER ASSEMBLY

Inspect webbing for signs of contamination, cuts, fraying, burns, and loose or broken stitching. If any damage is found in excess of three stitches, strike the assembly from service and replace it in accordance with the applicable rigging and packing procedures.

If less than three stitches are loose or broken, repair the harness or riser assembly using nylon 6 cord. Lock-stitch over the original stitch and 3/4 inches on both sides, 4 to 6 stitches per inch.

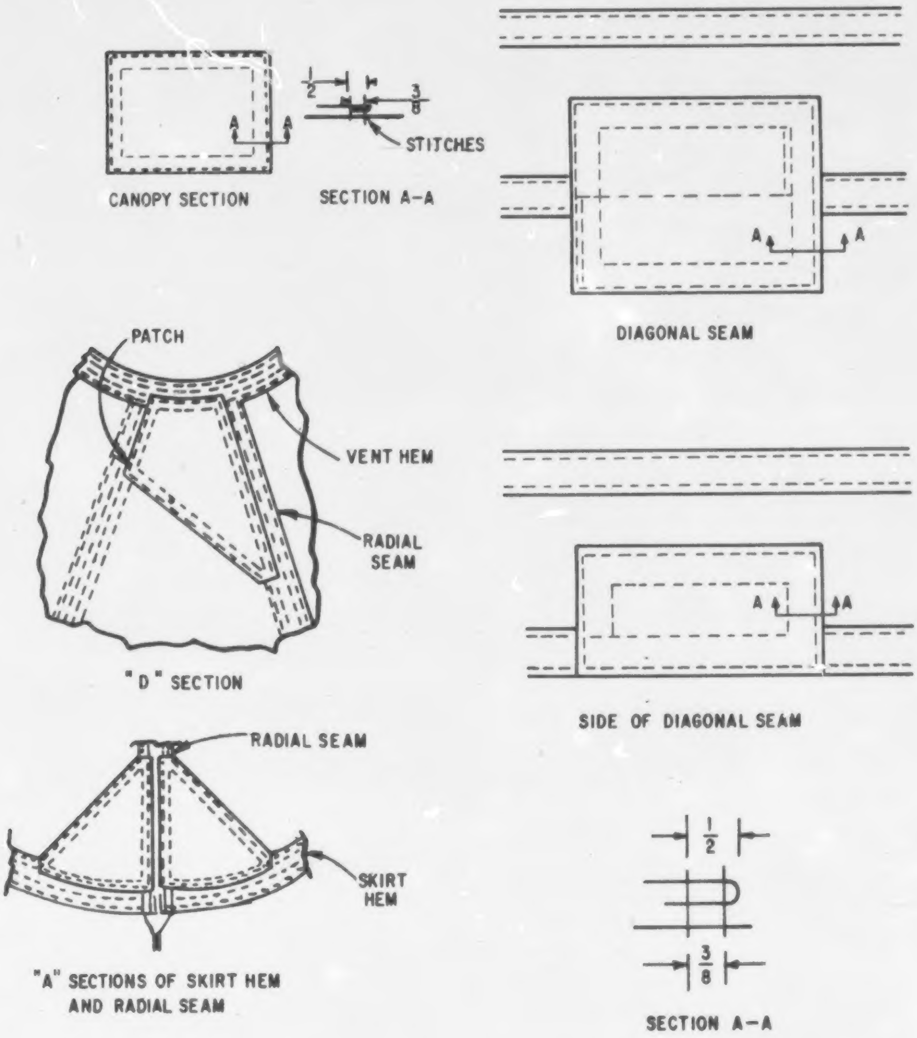
1/2
3/8
A
A
STITCHES
CANOPY SECTION
SECTION A-A
A
A
DIAGONAL SEAM
PATCH
VENT HEM
RADIAL SEAM
"D" SECTION
A
A
SIDE OF DIAGONAL SEAM
RADIAL SEAM
SKIRT HEM
"A" SECTIONS OF SKIRT HEM AND RADIAL SEAM
1/2
3/8
SECTION A-A

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Figure 10-8.—Single patching.

HARDWARE

Inspect canopy quick-release fittings for breaks, corrosion, pitting, bends, dents, and sharp edges. Check for presence of the tamper dot on the locking screw. Remove any sand or dirt from the mechanism using an air hose at not more than 50 p.s.i. pressure. Wipe dirt and grease from the fittings with a clean rag. Do not lubricate.

PILOT CHUTE

Inspect the fabric surface, vanes, rib pockets, seams, and suspension lines for contamination or any type of damage. Inspect the spring

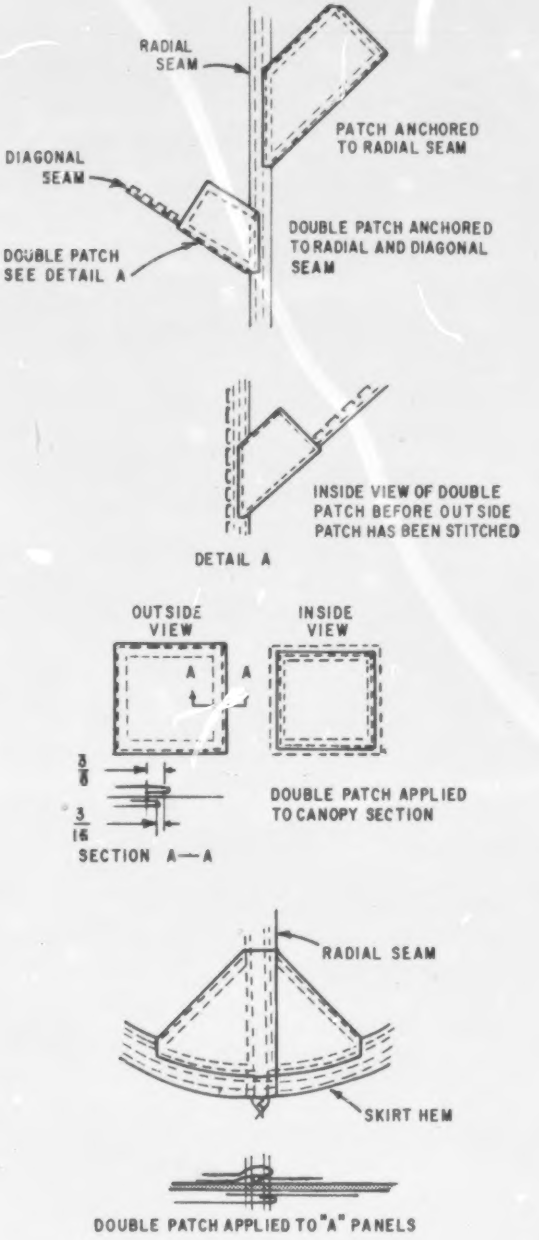
RADIAL SEAM
PATCH ANCHORED TO RADIAL SEAM
DIAGONAL SEAM
DOUBLE PATCH ANCHORED TO RADIAL AND DIAGONAL SEAM
DOUBLE PATCH SEE DETAIL A
INSIDE VIEW OF DOUBLE PATCH BEFORE OUTSIDE PATCH HAS BEEN STITCHED
DETAIL A
OUTSIDE VIEW
INSIDE VIEW
A
A
3/8
3/16
SECTION A—A
DOUBLE PATCH APPLIED TO CANOPY SECTION
RADIAL SEAM
SKIRT HEM
DOUBLE PATCH APPLIED TO "A" PANELS

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Figure 10-9.—Double patching.

assembly and replace any loose or broken tackings. If the pilot chute has deteriorated to such an extent that the unit may impair efficiency of operation, scrap the damaged pilot chute and replace with a new or serviceable one.

PILOT PARACHUTE CONNECTOR CORD

Inspect the pilot parachute connector cord for proper length, contamination, fraying, cuts, and loose or broken stitches. If damaged or improper length, replace the connector cord.

Measure and cut the type and amount of nylon webbing as determined by the type of parachute assembly concerned. For all parachute assemblies except MBEU, count the number of vent lines at the vent hem, group 8 vent lines for a 26-foot canopy, 14 vent lines for a 28-foot canopy and 15 vent lines for a 35-foot canopy. For all assemblies except the MBEU, using a bowline knot, attach one end of the new connector cord around the lines grouped as mentioned in the above paragraph. Attach the remaining end of the cord to the loop in the pilot parachute using a bowline knot. Center the new connector cord on the vent lines. Insure that the finished length is within limits.

NOTE: The NES-8 pilot parachute connector cord is an integral part of the pilot chute. If damaged, replace the entire assembly.

MBEU pilot parachute connector cords must be marked and stitched, using nylon 3-cord (V-T-295), 7 stitches per inch. Backstitch a minimum of 3/4 inch. Insure that the finished length is 60 ± 1/4 inches.

To attach the MBEU pilot chute connector cord, secure the small loop end to the eye in the pilot parachute with a lark's head knot. Counting the number of vent lines at the vent hem, group 12 vent lines. Pass the large loop end of the connector cord under the lines and through the ejector board grommet. Tie the cord with a lark's head knot. (See fig. 10-10.)

CONTAINER REPAIR

Reconditioning of the container can be accomplished with or without a sewing machine. Patches, modifications, additions, attachment of cushions or liferaft cases, or other repairs of any nature may not be made while the parachute is in a packed condition. To do so is to risk the

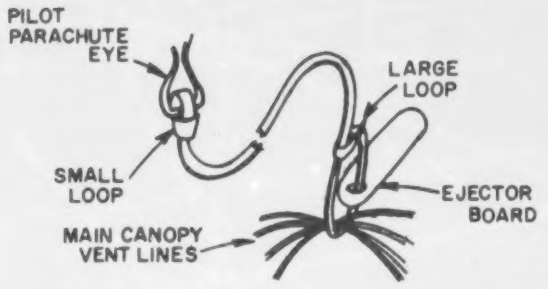

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Figure 10-10.–Attaching MBEU pilot chute connector cord.

possibility of accidentally securing one of the main parts of the parachutes to the container and slowing or possibly preventing the proper opening of the parachute in an emergency.

To repair small holes, tears, or snags, 1/2 inch square or less, machine darn in the same direction as the weave, using size E nylon thread. To reinforce corners and edges, use flat webbing; do not use tubular webbing or light herringbone tape.

Cut flat webbing to size and sear ends; if necessary, remove container frame. Boxstitch webbing over the damaged area with size FF nylon thread, 8 to 10 stitches per inch.

To patch large holes, tears, or rips, the container repair material used must be the same as the type used to construct the container. Do not use overaged or salvaged material. Cut the patch large enough to fully cover the damaged area, overlap 3/4 to 1 inch and allow for the edges to be turned under 1/2 inch.

Place the patch over the damaged area, folding edges under 1/2 inch, sew two rows of stitches around the edge of the patch, and backstitch at least 3/4 inch.

Original manufacturing details of the container should be noted, and any repairs should reproduce these details as closely as possible.

GROMMET REPAIR

Defective or missing grommets must be replaced, using special dies. The same size grommet and grommet washer used in the manufacture of the container assembly must be used for the replacement.

To repair the damaged area, cover the hole in the container assembly with a square patch that is 3/8 inch larger than the grommet washer. Stitch the patch on all four sides with two rows of stitching. Turn raw edges under 1/4 inch and sew using 8 to 10 stitches per inch. The patching material must be nylon cloth, 7.5-ounce MIL-C-7219.

Care must be taken when applying the reinforcement so that the thickness around the grommet will not be increased to such an extent as to prevent the locking pins from passing through the holes in the cones. Care must be taken that the edges of the grommets are perfectly smooth and rounded so as not to obstruct the operation of the locking pins or retard the action of the grommets in slipping off the cones.

Future parachute assembly containers will have the grommets installed with the washer facing away from the ripcord pins to prevent the locking pin from jamming the cone.

HANDSTITCHING

Handstitching is seldom done by an Aircrew Survival Equipmentman but there will always remain a need for a hand-held needle application of stitching. Machines are not always available and often lack the flexibility inherent in hand stitching. Many areas still exist in which handstitching is the best approach to making a repair or an assembling step. Realizing these possibilities, a PR should know how to use a number of the fundamental tackings.

Areas that require an application of hand sewing procedures are the replacement of locking cones and/or the opening band hook eyelets.

When locking cones have become corroded, have bent or broken flanges, or are worn where the grommets or end tabs bear, they must be replaced. Before any attempt is made to replace a locking cone, evaluate the advisability of the locking cone replacement of an individual basis (i.e., would a knot cause a lump between the plys of material, or does the general condition of the container warrant the time expended on cone replacement).

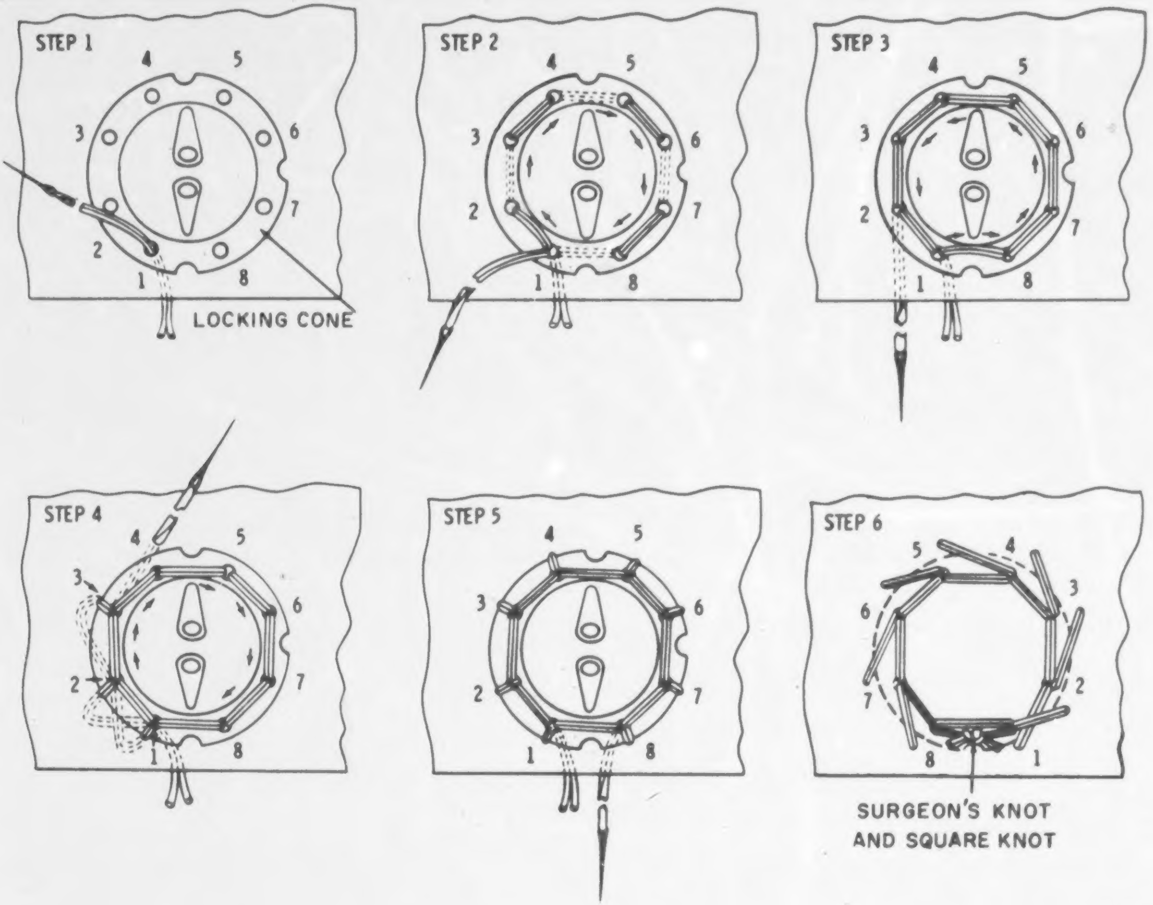

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Figure 10-11.–Handstitching locking cones to the parachute container.

When replacing locking cones on the parachute container, refer to figure 10-11.

Position the locking cone in the exact location formerly occupied by the damaged or missing cone. Make certain that the ripcord pin holes through the apex of the cone are in line with each other and also in line with the direction of ripcord pull. Replace locking cones in accordance with the steps depicted in figure 10-11 as follows:

1. Using waxed nylon 3-cord, doubled, push the tacking needle up through the main panels and cone flap until the needle point is through hole number 1 of the cone. Pull the needle and thread up through hole 1 until approximately 3 inches of thread remains below the panel (step 1).

2. Working clockwise, pass the needle down through hole number 2, up through number 3, and continue until all holes are threaded and the needle passes up through hole number 1. Take up all slack in the thread (step 2).

3. Working counterclockwise, pass the needle down through hole number 8, up through hole

number 7, and continue until the needle passes down through hole number 2. Take up all slack in the thread (step 3).

4. Pass the needle up through the panel next to the outside edge of the cone, directly in front of and opposite of hole number 1.

5. Working clockwise, pass the needle down through hole number 1, up through the panel to a point next to the outside edge of the cone in front of hole number 2, down through hole number 2, up through the panel in front of hole number 3, and down through hole number 3 (step 4).

6. Continue in the same manner until the needle passes down through hole number 8. Take up all slack in the thread (step 5).

7. Tie the ends of the thread off on the inside of the flap with a surgeon's knot followed by a square knot. Trim the thread ends to within 1/4-inch of the knots (step 6).

In replacing the opening band hook eyelets, position the new eyelet in the exact location formerly occupied by the damaged or missing eyelet. Make certain that the elevated end of the eyelet is in the up position so that it will engage the opening band hook.

Hand sew the eyelet using waxed E-nylon thread, doubled, tack the eyelet in place using 6 turns per loop and 3 turns between loops (15 turns in all). It does not matter in which order the stitches are made. Finish the tacking with the threads on the underside of the container material and tie off the loose ends using a surgeon's knot followed by a square knot.

INSPECTION OF COMPLETED WORK

Though many of the more common repairs have been covered in this chapter, this should not be construed to mean that such procedures are the only authorized repairs, as referenced in NavAir 13-1-6.2. Any time a parachute assembly may be reasonably restored to operational condition, repairs may be made.

The primary concern in repairing any assembly is insuring that the basic integrity designed into the assembly is maintained. All repair work must be carefully inspected and compared to drawings and specifications at completion of work to insure absolute conformity to drawings.

After making modifications or repairs, a complete inspection must be conducted prior to repacking the assembly. If the parachute assembly will not be repacked immediately, chain the suspension lines and place the assembly loosely in a stowage bag, storage bin, or designated storage area.

QUALITY ASSURANCE

The most critical periods for assuring the performance of a parachute are the original issue, calendar, special inspections, and the repacking of an assembly.

Therefore, quality assurance steps are provided for critical operations in the Shop Process Cards and the Personnel Parachute Manual, NavAir 13-1-6.2. When a step is underlined, the PR will perform the step and then have the performance verified by a collateral duty inspector.

In no case may a man who accomplished the repairs or repacking step perform his own quality assurance inspection.

SAFETY PRECAUTIONS

Due to the employment of pyrotechnic devices on various parachute assemblies, the following precautions are cited to insure safety of personnel performing maintenance and repair operations.

NB-11 PARACHUTE ASSEMBLY

The NB-11 assembly employs a fail-safe ballistic spreading gun. Do not remove folded canopy or suspension lines from the container before installing the spreading gun safety pin.

NB-7E AND LW-3B ASSEMBLIES

These assemblies employ a pyrotechnic static line cutter.

Do not open the container by pulling on the static line. Do not unpack the parachute before inserting the safety pin in the static line cutter device.

CARTRIDGE ACTUATED ASSEMBLIES

The NB-6, NB-7D, NB-7E, NB-8, NB-9, NB-10, NB-11, and NS-3 parachute assemblies employ cartridge operated automatic actuators. Insure that the automatic actuator arming cable is not pulled while the automatic actuator is armed.

SURVEY

To survey is to examine, inspect, or consider carefully. Therefore, survey boards are composed of an officer (or officers) appointed by the commanding officer to examine, inspect, or consider carefully the facts surrounding an accountable item which, for reasons of loss, damage, deterioration, or normal wear, must be expended from the records.

There are two types of surveys–formal and informal. The choice of survey to be used is designated by the systems command concerned with the item to be surveyed, or by the commanding officer. The formal survey is made by a commissioned officer appointed by the commanding officer, or by a survey board appointed by the commanding officer and consisting of three officers, one of whom must be a commissioned officer.

The custodian of an item to be surveyed prepares a written statement of the circumstances as known or suspected; then the division officer originates a rough Survey/Request, Report and Expenditure Form, NavSup 154, through normal channels. This request provides a record showing the cause, conditions, and responsibility for the survey, and recommendations for disposition and authority to expend the item or materials from the records.

CHAPTER 11

SEWING MACHINES

The nature of the PR's work in the maintenance and upkeep of aviator's equipment requires that he have a thorough knowledge of the minor adjustments to be made, and the proper lubrication of standard sewing machines. He must also be a skilled operator of these machines in order to keep flight clothing and survival equipment in good repair.

This chapter gives a background for obtaining this knowledge, but the actual skill in operating machines can be acquired only by practice at sewing on scraps of material or on jobs which may not require a lot of skill such as manufacture of pitot covers, small flags or pennants, etc. It behooves the PR striker to use as much of the time spent in the loft as is possible in practice sewing.

SEWING MACHINE FAMILIARIZATION

Sewing machines are divided into two types, OSCILLATING and ROTARY. Both types are operated by electric motors and are fitted with rheostats and special clutch arrangements which enable the operator to control the speed.

Oscillating type sewing machines are named for the action of the sewing hook, which rocks back and forth through half of one revolution to complete one stitch.

Rotary type sewing machines are also named for the action of the sewing hook, which makes two complete revolutions to complete one stitch.

The type of stitch commonly used and made by sewing machines in repair work is the lockstitch. The lockstitch makes use of two separate threads. One comes from the spool down through the eye of the needle, the other from the bobbin. In making the lockstitch, these two threads must become interlocked, as shown in figure 11-1.

The thread passing through the eye of the needle is pushed down through the material being sewn. As the needle travels downward to the material, a thread controlled spring pulls on the needle thread to prevent any slack that might tangle the thread around the needle.

After the needle reaches its lowest position and starts its upward movement, a small loop of thread forms alongside the needle beneath the throat plate. The sewing hook catches this loop and carries it around the bobbin, which floats in its track in the bobbin case. By locking the loop of needle thread around the bobbin thread, the sewing hook forms the stitch.

As the needle completes its upward movement, the thread tension disks hold the needle thread firmly, and the thread takeup lever, rising quickly, pulls on the loop that has been formed and thus tightens the stitch. When the thread takeup lever reaches its highest position, the stitch is completed.

The standard sewing machine has four basic parts: bed, uprise, arm, and face. The BED houses the linkage from the safety clutch pulley to the sewing hook assembly; the UPRISE houses the arm shaft connection belt; the BALANCE WHEEL is connected to the arm shaft in the ARM which operates the needle bar mechanism in the FACE of the machine.

The machine is powered by an electric motor, which is connected to the motor driving pulley by a clutch. The motor is connected to the clutch by pressing the forward part of the foot treadle. The aft part of the treadle is the brake which acts upon the clutch.

The material to be sewn is held in position on the feed dog by the presser foot. The pressure of the presser foot upon the material enables the feed dog to push the material forward each time the needle goes up. The pressure of the presser foot on the material is released either by

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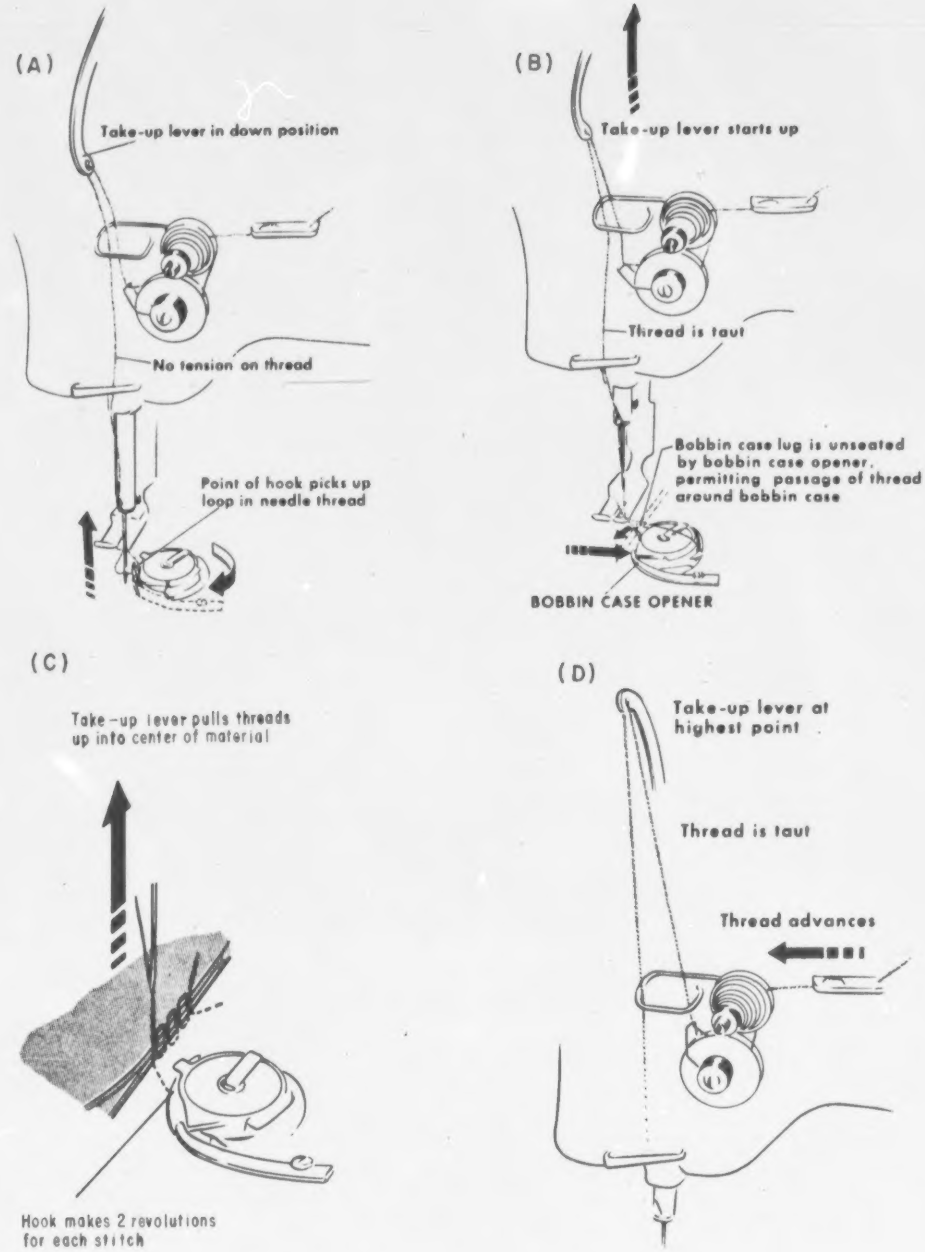
(A)
Take-up lever in down position
No tension on thread
Point of hook picks up loop in needle thread
(B)
Take-up lever starts up
Thread is taut
Bobbin case lug is unseated by bobbin case opener, permitting passage of thread around bobbin case
BOBBIN CASE OPENER
(C)
Take-up lever pulls threads up into center of material
Hook makes 2 revolutions for each stitch
(D)
Take-up lever at highest point
Thread is taut
Thread advances

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Figure 11-1.—The lockstitch.

a knee lifter or a hand lifter. The presser foot can be raised by pushing the knee lifter to the right. The hand lifter is located behind the face of the machine. The presser foot may be lifted and locked into position by raising the hand lifter to its highest position.

OSCILLATING TYPE SEWING MACHINES

Two of the most commonly used oscillating type sewing machines are the 31-15 and 7-33, both of which are discussed in this chapter.

SINGER SEWING MACHINE 31-15

The 31-15 is an oscillating type sewing machine which has a recommended speed of 2,200 stitches per minute and makes a lockstitch. The 31-15 is intended for sewing clothing. It is very good for nylon cloth sewing and can be used for sewing lightweight canvas up to 8 ounces. The number of stitches can be regulated from 7 to 32 stitches per inch.

When the 31-15 machine is in operation, the balance wheel turns over toward the operator. When hand-turning the balance wheel, always rotate in this direction.

The components of the Singer Sewing Machine 31-15 are shown in figure 11-2.

Lubrication

To insure easy operation and to prevent unnecessary wear of the moving parts, all sewing machines need oiling. When a machine is in constant use, it should be oiled twice a day. A new machine should be oiled more frequently when in constant use. A castor base oil is recommended since mineral base oil tends to gum the moving parts.

Oiling points for the 31-15 machine are shown in figures 11-3, 11-4, and 11-5.

Oil should be applied regularly to the shuttle bearing in the shuttle race. Occasionally remove the faceplate and apply oil to the bearings and points that are uncovered.

Needles and Thread

The proper needle to be used on the 31-15 Singer Sewing Machine is class and variety 16 x 87. Needles are available in various sizes and any of the following sizes may be used: 14, 16, 17, 18, 19, 21, 22, and 23. The size of thread and material used determines the size of needle to be used. Needles vary in size according to number: the smaller the number, the smaller the needle eye; the larger the number, the larger the needle eye. Needles do not vary in length within the same class and variety.

Orders for needles must specify the QUANTITY required, the SIZE number, and the CLASS and VARIETY number, separated by an "X."

An example of an order follows:

100 No. 18, 16 x 87 needles.

Best results will be obtained in using needles furnished by the manufacturer of the machine.

Figure 11-6 shows the six parts of a needle used in an oscillating type sewing machine.

The thread to be used on an oscillating type sewing machine is LEFT TWIST (also known as Z twist). Either right or left twist thread can be used in the bobbin, but to eliminate the possibility of mixing the machine and bobbin thread, it is advisable to order only left twist thread.

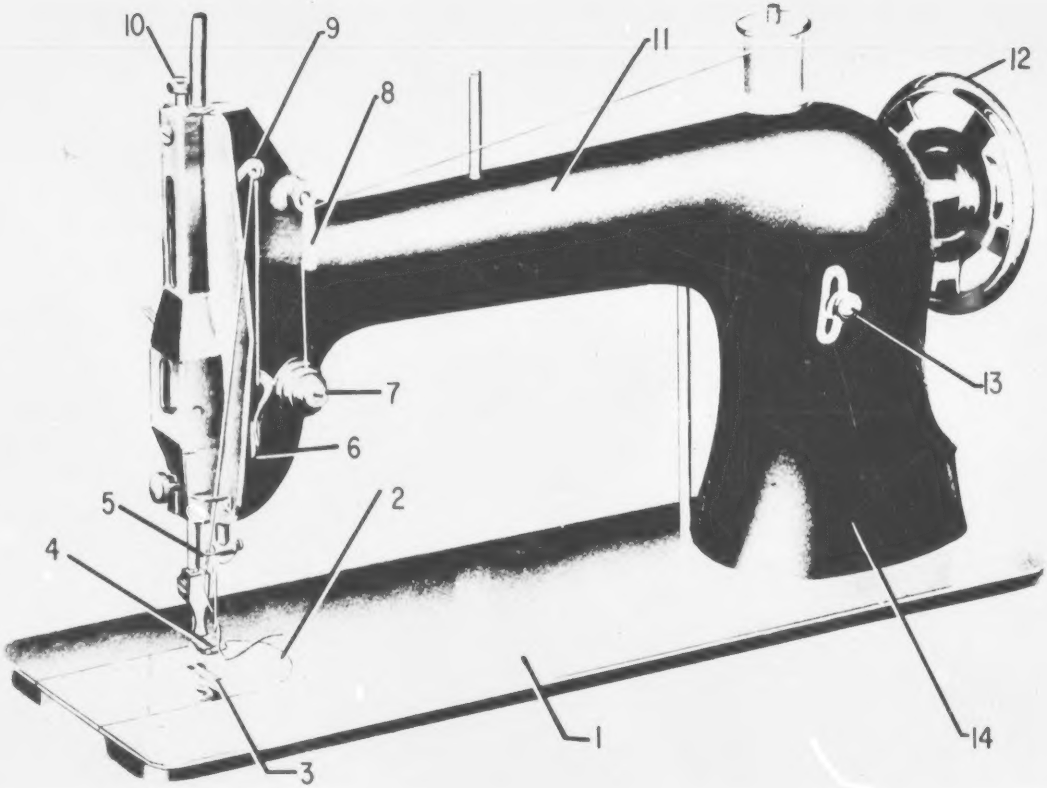
To determine the twist of thread, hold the thread as shown in figure 11-7. Turn the thread toward you with the right hand; if it is left twist, the strands will wind tighter; if it is right twist, the strands will unwind.

To determine the relative sizes of needles and threads that can be used, refer to table 11-1.

Operation

The following practices and procedures will help to insure safe and smooth operation of the sewing machine:

1. The balance wheel must always turn toward the operator.
2. Do not run the machine with the presser foot resting on the feed dog without material being under the presser foot.
3. Do not run the machine when both bobbin case and needle are threaded unless there is material under the presser foot.
4. Do not try to help the machine by pulling the material. You may bend or break the needle. If properly adjusted, the machine feeds the work without assistance.



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1. Bed.
2. Throat plate.
3. Feed dog.
4. Presser foot.
5. Needle bar.
6. Face.
7. Upper tension regulating thumb nut.
8. Thread retainer.
9. Thread takeup lever.
10. Pressure bar pressure regulating thumbscrew.
11. Arm.
12. Balance wheel.
13. Stitch regulator thumbscrew.
14. Uprise.

Figure 11-2.–Singer sewing machine 31-15.

5. The slide over the bobbin case should be kept closed when the machine is in operation.

6. Keep your head away from the takeup lever.

7. When running the machine do not take your eyes away from the needle and presser foot.

8. Keep your fingers from under the needle.

Setting the Needle

Turn the balance wheel toward you until the thread takeup lever moves upward to its highest point; loosen the setscrew in the needle clamp, insert the needle ALL THE WAY into the needle bar so that the long groove of the needle is toward the left, and the eye of the needle is directly in line with the arm of the machine;

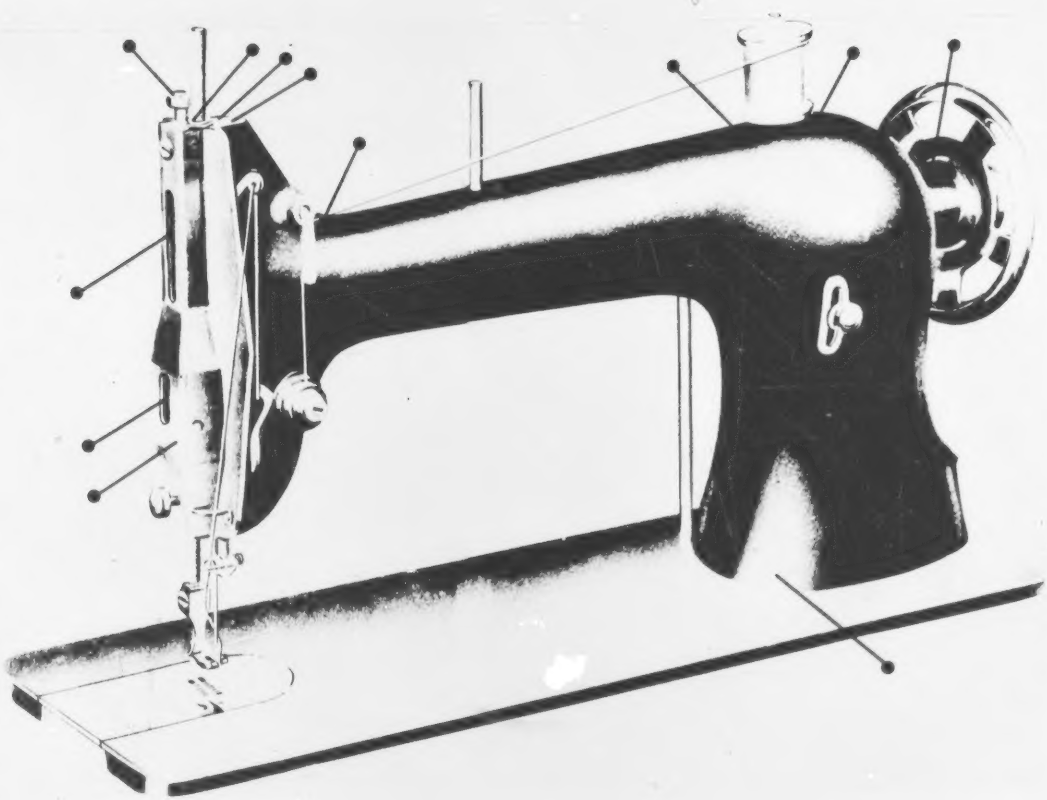

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Figure 11-3.–Oiling points at the front of the machine.

then retighten the setscrew. NOTE: When setting any needle, always insert it with the long thread groove away from the bobbin.

Threading the Machine

Threading a sewing machine is a very simple job. The procedure may vary slightly with different models; but after working with the various machines in the loft, the task will become automatic.

The procedure for threading the 31-15 sewing machine is illustrated in figure 11-8 and described in the following paragraph.

Pass the thread from the thread stand to the thread post on top of the machine, right to left through the bottom hole, and then right to left through the top hole. Pass the thread from right to left through the top hole in the thread retainer (1). Pass the thread from left to right through the middle hole in the thread retainer (2). Pass the thread from right to left through the bottom hole in the thread retainer (3). The thread is then passed down and under from right to left between the tension disks (4). Draw the thread up into the thread takeup spring (5), drawing the thread up and beyond the spring end so that it comes out in the center of the spring. The thread is then placed under the tension thread guard (6). Pass the thread up and from right to left through the hole in the thread takeup lever (7). The thread is now drawn down through three thread guides (8), (9), and (10). Pass the thread from left to right through the eye of the

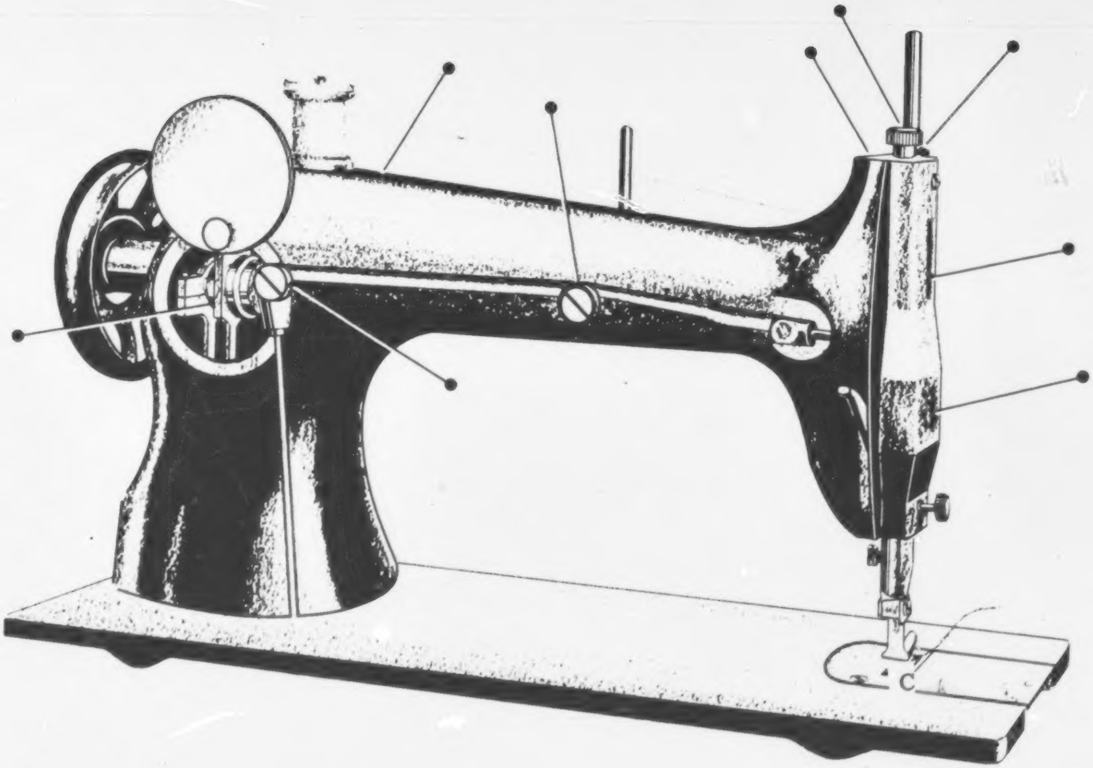

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Figure 11-4.–Oiling points at the back of the machine.

needle (11). Draw about 2 inches of thread through the eye of the needle with which to commence sewing.

Removing the Bobbin Case

Before attempting to remove the bobbin case, turn the balance wheel toward you until the needle moves upward to its highest position.

Remove the slide in the bed of the machine for visibility, reach under the table with the left hand, and using the thumb and forefinger, open the bobbin case latch (1, fig. 11-9), and lift out the bobbin case (2).

While the latch is held open, the bobbin is retained in the bobbin case. Release the latch, turn the open end of the bobbin case down, and the bobbin will drop out.

Winding the Bobbin

The bobbin winder is fastened to the table with its driving pulley in front of the sewing machine belt. The bobbin winder is so positioned to allow the pulley to drop away from the belt when sufficient thread has been wound on the bobbin.

Figure 11-10 illustrates the bobbin-winding operation. The procedure is as follows: Place the bobbin on the bobbin winder and push it on the shaft as far as it will go. Pass the thread from the spool down through the thread guide (1). Loop the thread around back and through the tension disks (2).

The thread is then wound around the bobbin a few times and the pulley pushed up against the machine belt. The bobbin can be wound

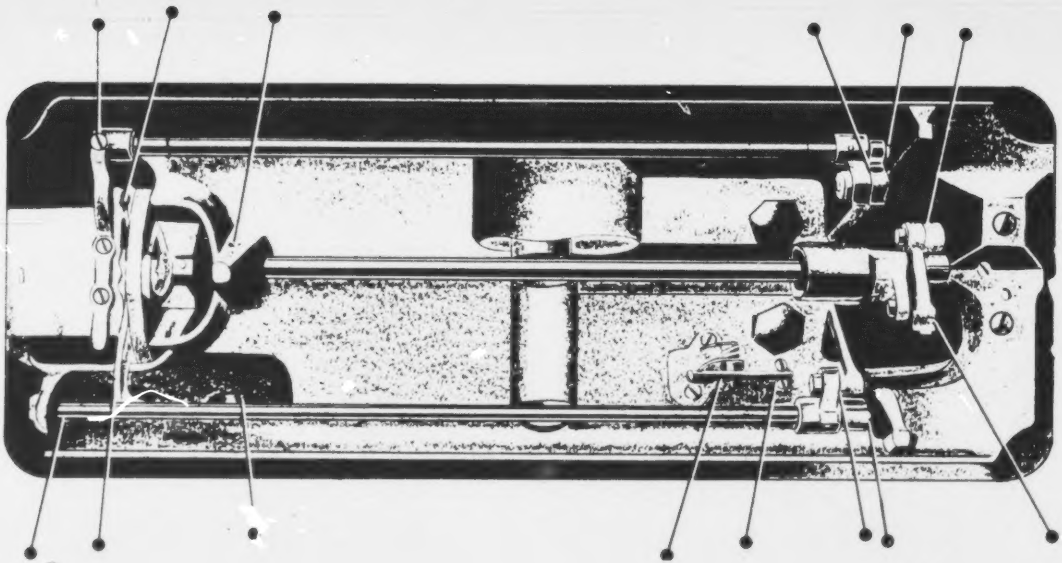

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Figure 11-5.—Oiling points at the base of the machine.

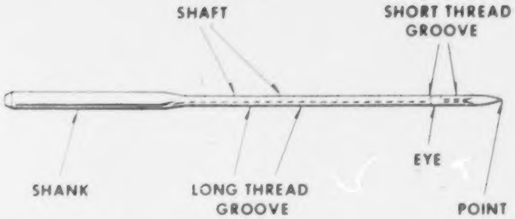

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Figure 11-6.—Sewing machine needle adaptable to the 31-15 sewing machine.

Table 11-1.—Relative sizes of needles and thread.

Sizes of needles	Cotton thread size	Nylon thread size
18	24 x 4	A and B.
19	24 x 4	C.
21	24 x 4	E.
22	16 x 4	E.

while the machine is being used for sewing. If there is no material under the presser foot, make certain that the presser foot is raised and not riding on the feed dog while winding the bobbin.

When sufficient thread has been wound on the bobbin, the pulley on the bobbin winder will drop back from the machine belt automatically. If the thread does not wind evenly on the bobbin, loosen the screw (3) in the tension bracket and move the bracket to the right or left as required; then tighten the screw. The amount of thread wound on the bobbin is regulated by the screw (4). To wind more thread on the bobbin, turn the screw to the right; to wind less thread on the bobbin, turn this screw to the left.

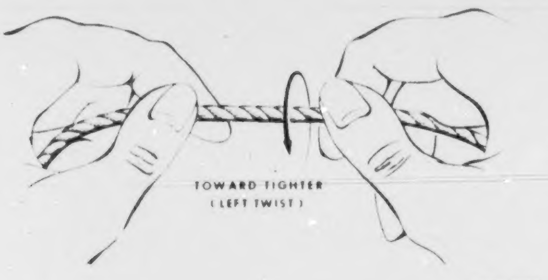

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Figure 11-7.–How to determine the twist of thread.

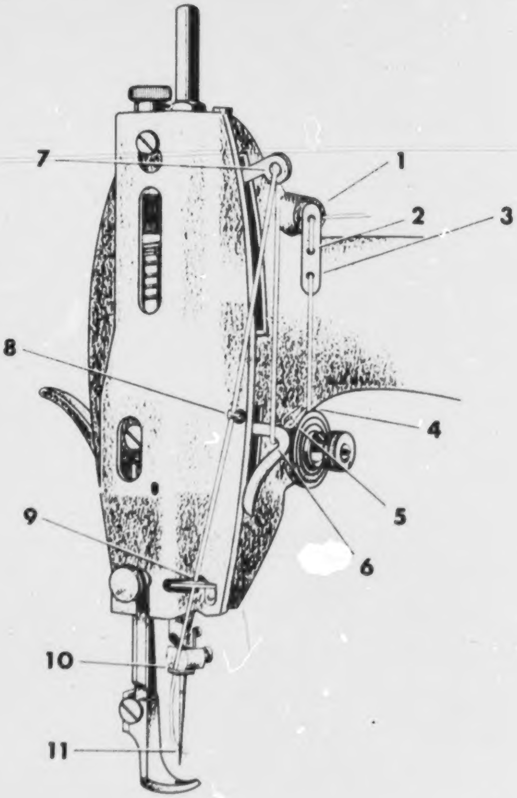
Threading the Bobbin Case

Hold the fully wound bobbin between the thumb and forefinger of the right hand with the thread end running over the top toward the right, as shown in figure 11-11 (A). With the left hand hold the bobbin case as shown, with the thread slot near the top.

Place the bobbin into the bobbin case and pull the thread into the slot in the edge of the bobbin case (B). Draw the thread down under the tension spring and into the delivery eye at the end of the tension spring (C). When the free end of the thread is pulled, the bobbin will rotate clockwise if the bobbin case has been threaded properly.

Replacing the Bobbin Case

Hold the latch open on the threaded bobbin case with the thumb and forefinger of the left hand, with the latch in a horizontal position. Place the bobbin case on the center stud of the shuttle body. Release the latch and press the bobbin case back until the latch catches the groove near the end of the stud.



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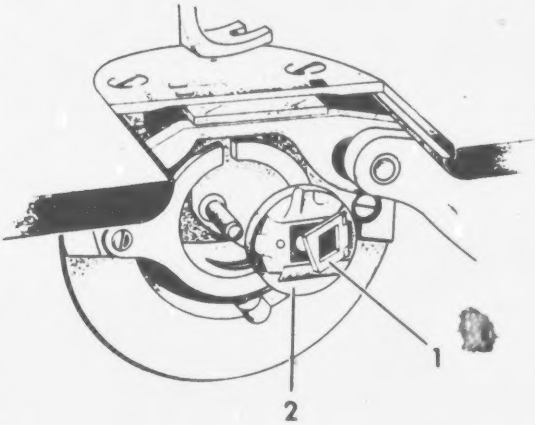
1. Top hole of thread retainer.
2. Middle hole of thread retainer.
3. Bottom hole of thread retainer.
4. Tension disks.
5. Thread takeup spring.
6. Tension thread guard.
7. Thread takeup lever.
8. Thread guide.
9. Thread guide.
10. Thread guide.
11. Needle eye.

Figure 11-8.–Threading the 31-15 sewing machine.

Preparing for Sewing

With the left hand, hold the end of the needle thread, leaving it slack from the hand to the needle. Turn the balance wheel toward you until the needle moves down and catches the bobbin thread. Continue to turn the balance wheel forward until the needle comes up and brings the bobbin thread up with the needle thread.

With the thread takeup lever at its highest position, lay both threads back under the presser foot.



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1. Bobbin case latch.
2. Bobbin case.

Figure 11-9.—Removing the bobbin case.

Commencing to Sew

Place the edge of the material beneath the presser foot, lower the presser foot, turn the balance wheel by hand until the needle is in the material, and press lightly on the treadle. To prevent fouling the needle thread in the bobbin case, hold the ends of both threads until the first few stitches are made.

While sewing, hold the work flat, but do not pull or push on the material. Let the feed dog carry the work evenly under the presser foot and needle. If the operator pulls on the material, the needle bends, strikes the throat plate, and is either dulled, or more likely, broken. When the needle is about to cross a seam or other unusually thick or uneven place in the work, disengage the clutch, and hand-turn the machine over the rough place; otherwise, the needle may be broken or thrown out of time.

Regulating the Tension

The tension on the needle thread should be regulated only when the presser foot is down. If the tension of the machine thread is not correct, it should be adjusted by turning the tension adjusting nut, as shown in figure 11-12. To INCREASE THE TENSION, turn the nut clockwise; to DECREASE THE TENSION, turn the nut counterclockwise.

The tension on the bobbin thread is regulated by the small screw in the bobbin case tension spring. To increase the tension turn the screw clockwise; to decrease the tension turn the screw counterclockwise.

This screw is very small and is easily lost if extreme care is not exercised in backing it out when decreasing the tension. If the screw is tightened excessively or is slightly too long, it will penetrate into the inside of the bobbin case and prevent removal of the bobbin.

When the tension on the bobbin thread has once been properly adjusted for a particular size of thread, it is seldom necessary to change it. A correct stitch can usually be obtained by varying the tension on the needle thread, which is an easier adjustment.

For ordinary stitching, the needle and bobbin threads should be locked in the center of the thickness of the material as shown in figure 11-13 (A). When adjusting the tensions, you will not have a cross section of the stitch.

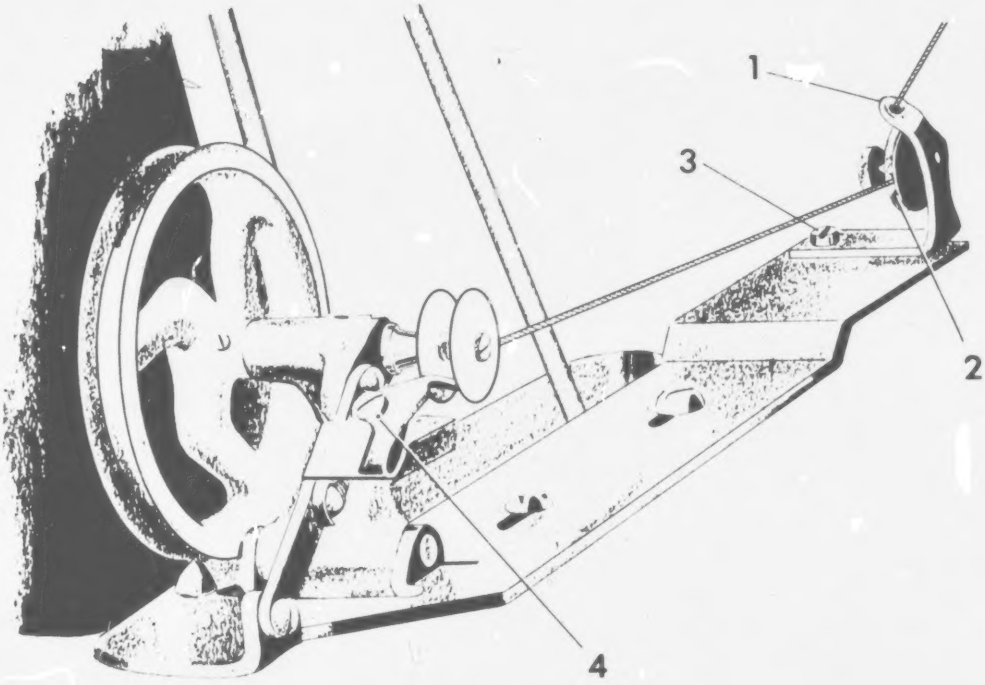
If the tension on the needle thread is too tight, or if the bobbin tension is too loose, the thread will lie straight along the upper surface of the material and appear as small loops (fig. 11-13 (B)).

If the tension on the bobbin thread is too tight, or if that on the needle thread is too loose, the bobbin thread will lie straight along the underside of the material (fig. 11-13 (C)).

Regulating the Length of Stitch

The length of stitch can be checked at the time the tension of the stitch is checked, as a trial run of stitches is necessary during both procedures.

The length of stitch is regulated by the thumbscrew in the slot on the front of the uprise of the machine. To LENGTHEN the stitch, loosen the thumbscrew and move the lever DOWN. To SHORTEN the stitch, loosen the thumbscrew and move the lever UP. When the desired length of stitch has been obtained by test running the machine on scrap material, tighten the thumbscrew.



1. Thread guide.
2. Tension disk.
3. Setscrew.
4. Bobbin winder stop latch screw.

Figure 11-10.–Winding the bobbin.

Regulating the Pressure on the Material

Pressure on the material is regulated by the pressure regulating thumbscrew on top of the machine face. To increase the pressure, turn the thumbscrew clockwise. The pressure should be just heavy enough to enable the feed dog to move the work along evenly.

Removing Work

Hand-turn the balance wheel toward you until the thread takeup lever is at its highest position. Raise the presser foot, either by the hand lever or by the knee lift, and draw the work and threads straight behind the presser foot. Cut the threads close to the material, leaving about 2 free inches of bobbin and machine thread.

Adjusting the Thread Takeup Spring

The thread takeup spring (fig. 11-12) should be set so that when the eye of the needle reaches the material on the downward stroke of the needle bar, the spring will be through acting on the thread, and will rest against the stop of the thread takeup spring regulator.

If the thread takeup spring is not correctly set, loosen the setscrew (2) in the arm of the machine and turn the tension adjusting stud to the right for more movement of the spring, or to the left for less movement. When the spring is correctly set, retighten the setscrew.

The tension on the thread takeup spring should be just sufficient to take up the slack of the needle thread until the eye of the needle reaches the material on its descent. To increase

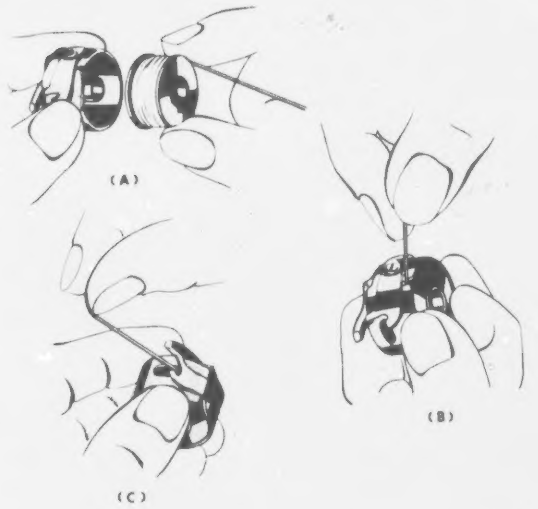


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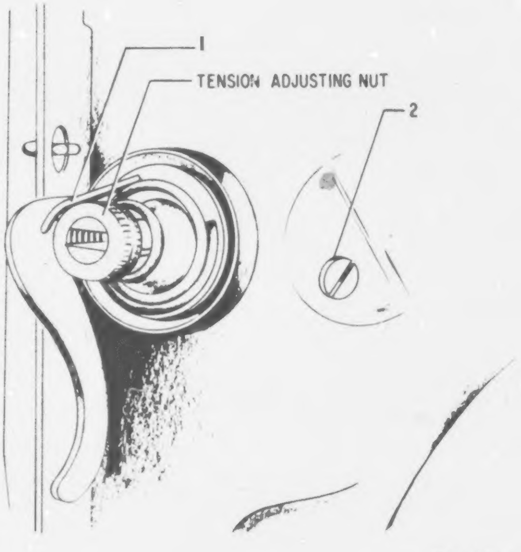
Figure 11-11.—Threading the bobbin case. (A) Inserting bobbin in case; (B) pulling thread into slot; (C) drawing thread into delivery eye.



PR.272

1. Thread takeup spring. 2. Setscrew.

Figure 11-12.—Adjusting the machine thread tension.

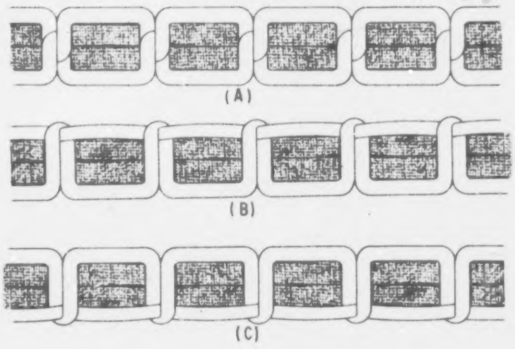


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Figure 11-13.—Properly and improperly adjusted tensions. (A) Properly adjusted; (B) needle tension tighter than bobbin; (C) bobbin tension tighter than needle.

the tension on the thread takeup spring, loosen the tension adjusting stud and move the takeup spring from the recess in the regulator to the right between the regulator and the tension disks. When the required tension is obtained, securely tighten the tension adjusting stud and move the spring back into its position in the regulator recess. To decrease the tension, move the spring to the left between the regulator and the tension disks.

SINGER SEWING MACHINE 7-33

The class 7-33 sewing machine is a lockstitch heavy duty machine and is intended for use in sewing heavy canvas, webbings, and other material not adaptable to the lighter duty sewing machines. The only difference between the 7-31 and the 7-33 is that the 7-33 has the clutch on the motor, while the 7-31 has the clutch on the balance wheel. The operation and maintenance techniques are identical.

As on any Singer Sewing Machine, the balance wheel of the 7-33 should always turn toward the operator.

Lubrication

The 7-33 machine is oiled at all the oiling points shown in figures 11-14 and 11-15. The

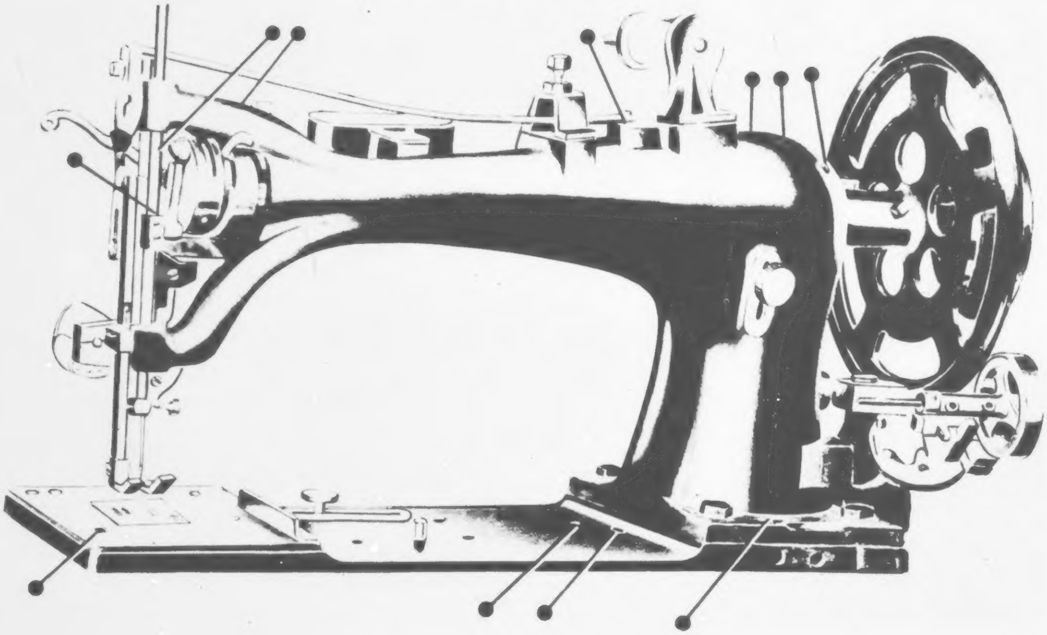

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Figure 11-14.–Oiling points at the front of the 7-33 sewing machine.

machine should be oiled twice daily when it is in constant use. Use a castor base oil as recommended by the manufacturer.

Needles and Thread

The procedure for ordering needles is the same for the 7-33 machine as for the 31-15 sewing machine. Refer to table 11-2 for the relative sizes of needles and thread.

Operation

The procedure for operating the 7-33 sewing machine is the same as for the 31-15 sewing machine.

Setting the Needle

The same procedure may be followed with this machine as for the 31-15 sewing machines.

Threading the Machine

Turn the balance wheel toward you until the thread takeup lever (7, fig. 11-16) moves up to its highest position. Pass the thread from the thread stand to the thread post, right to left through the bottom hole then right to left through the top hole. Pass the thread through the two thread guides (1) and (2). Continue the passage of thread between the retainer disks (3), down and under the tension disks (4). Pass the thread into the loop of the thread takeup spring (5), under the wire loop (6), up, and from back to front through the hole in the thread takeup lever (7). Now pass the thread down through the thread guide (8), into the slot in the vibrating presser bar (9), and on down through the thread guide (10) which is located on the needle clamp. The needle is now threaded from left to right through the eye of the needle (11). After the needle is threaded as shown in figure 11-16, pass the thread down through the hole

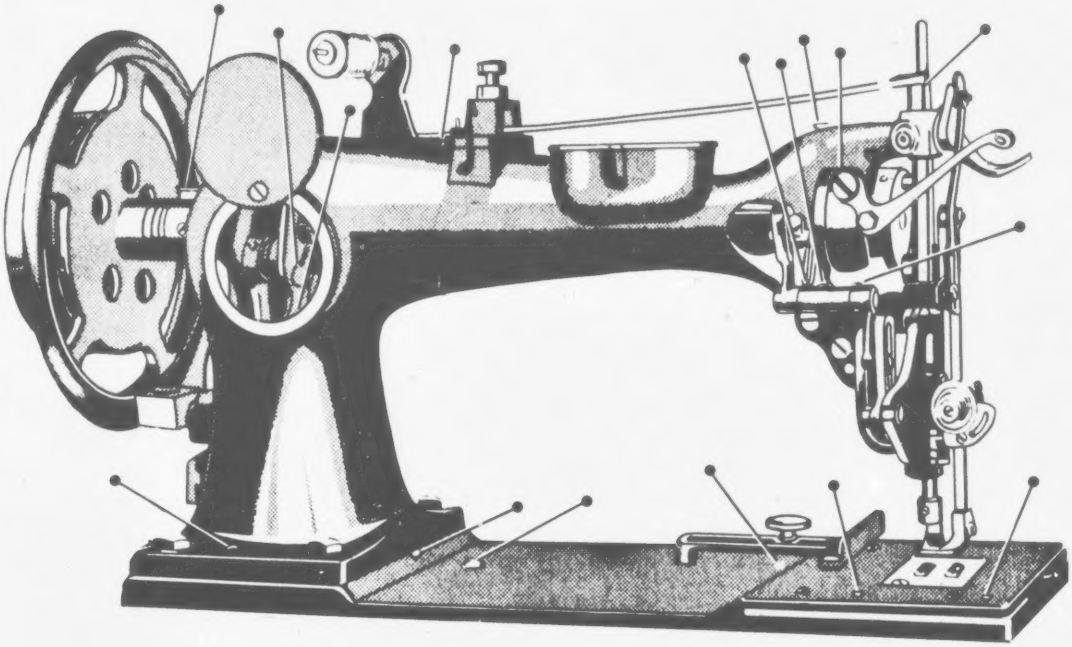

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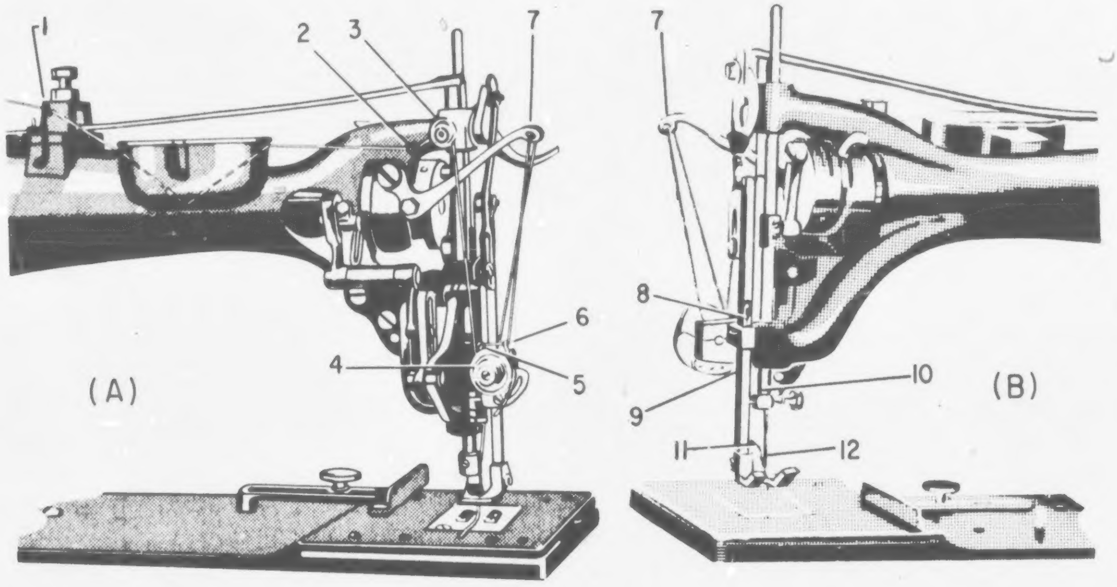
Figure 11-15.—Oiling points at the back of the 7-33 sewing machine.

Table 11-2.—Relative sizes of needles and thread.

Machine	Needle class and variety	Needle sizes	Classes of work	Needle size	Cord size
7-31 or 7-33	7 x 1	19, 21, 22, 23, 24 25, 26, and 27.	Medium to heavy canvas.	24	3-cord
7-31 or 7-33	7 x 5	28, 29, 30, and 31.	Heavy canvas and webbing.	28	6-cord

in the lifting presser foot (12). Draw about 4 inches of thread through the hole in the lifting presser foot with which to commence sewing.

Notice that the lubricating cup has been bypassed. No lubricant is used on the threads and cords used in the manufacture or repair of parachutes.



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1. Thread guide.
2. Thread guide.
3. Retainer disks.
4. Tension disks.
5. Thread takeup spring.
6. Wire loop.
7. Thread takeup lever.
8. Thread guide.
9. Slot in the vibrating presser bar.
10. Thread guide on the needle clamp.
11. Eye of the needle.
12. Hole in the lifting presser foot.

Figure 11-16.—Threading the 7-33 sewing machine.

Removing the Bobbin

Turn the balance wheel forward to bring the needle bar and thread takeup lever to its lowest position. With the aid of the shuttle opening tool or a small screwdriver, insert the blade end in the slot in the spring latch beneath the shuttle cylinder (fig. 11-17). Press the latch away from the cylinder and it will swing out. The bobbin will then slide out of the shuttle cylinder.

Winding the Bobbin

Place the bobbin on the bobbin winder spindle and push it up closely against the shoulder. The small pin in the shoulder must enter the slot in the bobbin.

Pass the thread from the thread stand through the hole in the left side of the bobbin from the inside. Push the bobbin winder pulley up against the balance wheel and place the bobbin winder latch in position. Raise the presser foot and start the machine. The end of the thread should be held until a few turns are wound on the bobbin to prevent slipping. When sufficient thread has been wound on the bobbin, the bobbin winder will stop automatically.

Replacing the Bobbin and Threading the Shuttle

Take the bobbin between the thumb and forefinger of the left hand as shown in figure 11-18. The free end of the thread should be drawn off from the underside toward the right. Place the

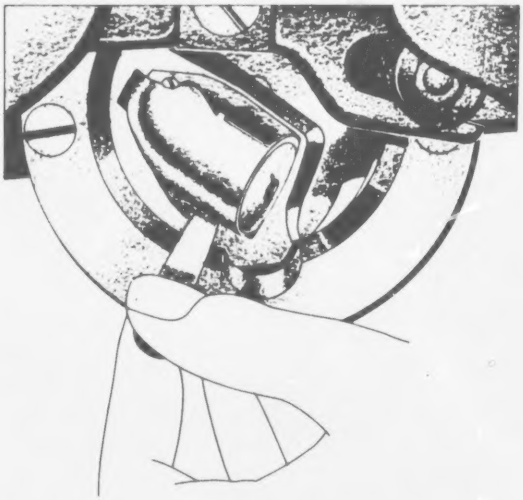

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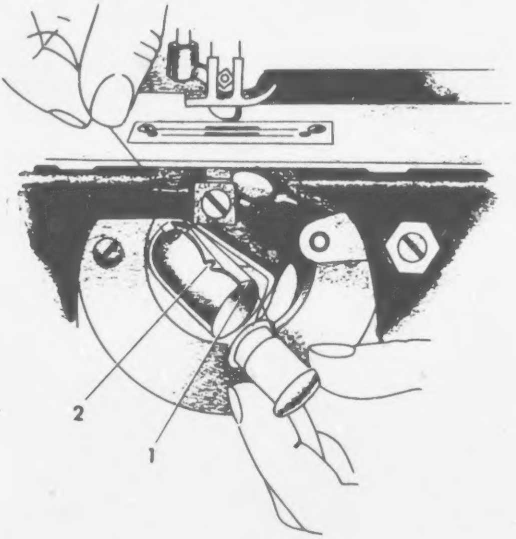
Figure 11-17.—Removing the bobbin from the shuttle cylinder.



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1. Thread slot in the cylinder.
2. Delivery eye and tension spring.

Figure 11-18.—Replacing the bobbin and threading the shuttle.

bobbin in the shuttle cylinder as far as it will go. Draw the thread into the slot in the cylinder (1) and under the tension spring into the delivery eye (2). Push the shuttle cylinder in until it is locked by the spring latch. There should be about 3 inches of thread hanging free from the shuttle with which to commence sewing.

Regulating the Tension

The tension on the needle thread is regulated by the thumb nut at the front of the thread retainer disks. The tension on the thread retainer disks should be just enough to cause the tension wheel to turn when the thread is taken from the spool.

The tension on the bobbin thread is regulated by the small screw which holds the tension spring to the shuttle cylinder. To increase the tension, turn the screw clockwise. To decrease the tension, turn the screw counterclockwise.

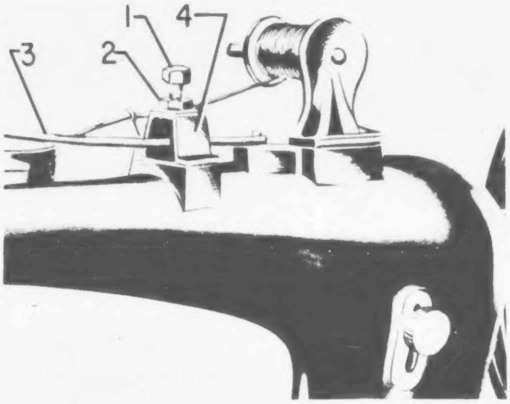
The tension on the machine and bobbin threads should be checked by test running a row of stitches on scrap material. The lockstitch should lock in the center of the material as described for the 31-15. When sewing webbings with the 7-33 sewing machine, the specifications for webbing sewing should be checked to determine at what ply of the webbing the stitch should lock.

Regulating the Length of Stitch

The procedure for regulating the stitch on the 7-33 sewing machine is the same as for the 31-15.

Regulating the Pressure on the Material

The pressure on the material is regulated by means of the hexagon head screw (1, fig. 11-19). Loosen the hexagon head locknut (2) and turn the adjusting screw clockwise to increase the pressure or counterclockwise to decrease the pressure on the spring (3). When the desired pressure has been obtained, hold the adjusting screw with a wrench to keep it from turning while the locknut is being tightened against the bracket (4).



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1. Hexagon head adjusting screw.
2. Hexagon head locknut.
3. Spring.
4. Bracket.

Figure 11-19.–Regulating the pressure on the material.

The pressure should be just heavy enough to enable the feed dog to move the work along evenly, and to prevent the work from rising with the needle.

Preparing for Sewing

The same sewing preparatory procedures are used for the 7-33 as for the 31-15 sewing machine except there is no knee lifting device. The hand presser bar lifter is the only device provided for lifting the presser foot on the class 7-33 sewing machine.

Removing the Work

Stop the machine and raise the thread takeup lever to its highest position. Draw about 3 inches of thread through the thread retaining disks. Raise the presser foot and draw the work back, cutting the threads close to the material. Leave the ends of the threads under the presser foot.

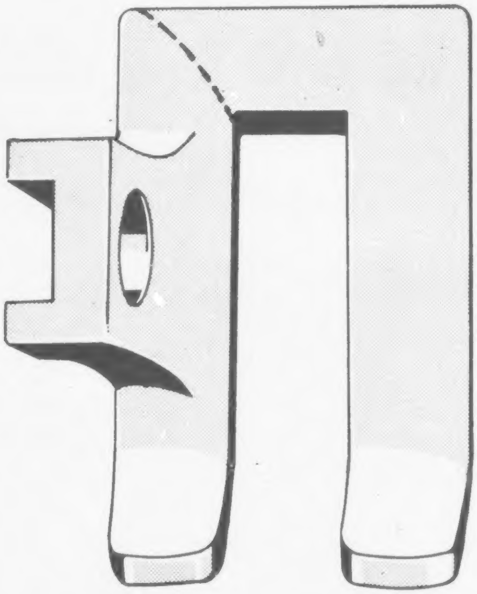

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Figure 11-20.–Modification of presser foot for webbing sewing.

Modification of Presser Foot for Webbing Sewing

The modification of a presser foot is illustrated in figure 11-20. The presser foot should be cut along the dotted line, removing the right portion of the foot. After cutting, the edges should be filed down to a smooth round finish.

Parachute harness and webbing sewing is classified as a major repair. However, there are various other sewing projects requiring webbing sewing.

ROTARY TYPE SEWING MACHINES

SINGER SEWING MACHINES CLASS 111

111 W 150 Sewing Machine

The 111 W 150 sewing machine is a high-speed, single-needle, lockstitch, compound feed machine employing a gear driven rotary hook with a vertical axis. It is designed for sewing mediumweight fabrics such as flight clothing, nylon, twills, and lightweight canvas.

111 W 151 Sewing Machine

The 111 W 151 sewing machine is also a single-needle, lockstitch, rotary hook machine, intended for high-speed straight stitching of medium heavy materials.

The 111 W 151 sewing machine differs from other models of the class 111 machines in that it has a single presser foot instead of the alternating presser foot.

111 W 152 Sewing Machine

The 111 W 152 sewing machine is a single-needle, lockstitch, compound feed machine with a vertical axis sewing hook. This machine has alternating pressers with a 3/8-inch lift. It has a safety clutch which prevents the hook from being damaged or getting out of time due to accidental strain.

111 W 153 Sewing Machine

The 111 W 153 sewing machine is similar to the 111 W 152, but it is used for sewing heavy work such as automobile and truck upholstery, tents, awnings, and leather flight jackets.

111 W 154 Sewing Machine

The 111 W 154 sewing machine is also similar to the 111 W 152, but its alternating pressers have a lift of 1/2 inch and the machine is designed for stitching upholstery work and leather coats and binding heavy materials such as felt padding.

111 W 155 Sewing Machine

The 111 W 155 sewing machine is similar to the 111 W 154 except that its minimum stitch length is 3 1/2 to the inch, and it has an adjustable lifting eccentric for instantly setting the alternating pressers to the minimum amount of lift required for the work to be sewn.

Lubrication of the Class 111 Sewing Machines

Figures 11-21 through 11-24 show the various lubrication points on class 111 sewing machines. Oiling points are indicated by the unnumbered arrows. Familiarization with the nomenclature of the machines may also be accomplished by studying these illustrations.

To lubricate the class 111 machine, swing back the top cover and oil the bearings, then replace the cover.

Loosen the thumbscrew in the upper end of the faceplate, turn the faceplate upward, and oil the wick and bearings as shown in figure 11-22. After oiling, turn down the faceplate and tighten the thumbscrew.

Turn the machine back on its hinges and apply oil at the places designated by the arrows in figure 11-24. All contacting parts on the bottomside of the machine should also be oiled.

To lubricate the hook, remove the bed slide and place oil in the oil well (fig. 11-23). This will lubricate the upper hook bearing and the mechanical opener mechanism.

The small green felt pad on the side of the bobbin case should be kept wet with oil to lubricate the hook race. When this pad is wet, it appears nearly black; when it appears light green, it indicates that it is dry. When a machine is new, oil should be applied to this felt pad EACH TIME A BOBBIN IS REPLACED.

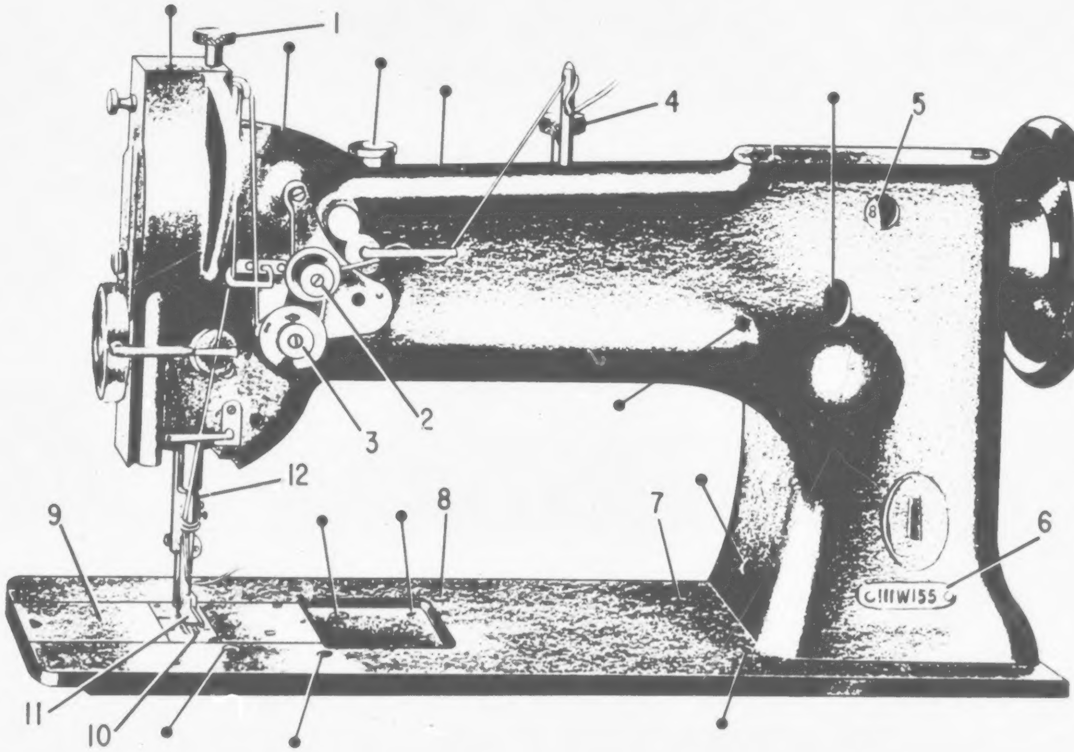
Needles and Thread

The thread used on rotary type sewing machines is left twist. To determine the twist of thread, refer to figure 11-6.

Table 11-3 lists the class and variety of needle and the needle size range for each of the class 111 machines.

The size of needle to be used is determined by the size of the thread and material used. The thread must pass freely through the eye of the needle. If rough or uneven thread is used, or if it passes with difficulty through the eye of the needle, the machine will not function properly.

Needles used on rotary type sewing machines are ordered the same way as those for oscillating type sewing machines.



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1. Vibrating presser bar thumbscrew.
2. Tension thumb nut.
3. Thread controller stud thumb nut.
4. Presser bar spring regulating screw.
5. Stitch indicator disk view hole.
6. Model number.
7. Hook driving shaft lock stud.
8. Feed regulating stud (plunger).
9. Bed slide.
10. Throat plate.
11. Presser foot.
12. Needle bar.

Figure 11-21.—Front of machine, showing oiling points.

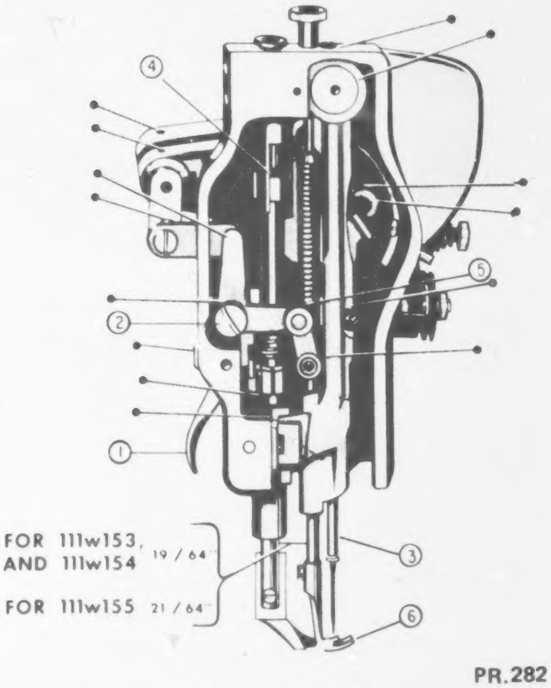
The needles for the rotary type sewing machines have 7 parts. This is one more part than the needles for the oscillating machines. The additional part is the SCARF, which is a small indention just above the short thread groove. The purpose of the scarf is to permit the point of the sewing hook to come close enough to pick up the needle thread without striking the needle.

Operation

Operation of the rotary type sewing machines is the same as for the oscillating sewing machines.

Setting the Needle

Turn the balance wheel toward you until the needle bar moves up to its highest position.



1. **Hand lift for presser foot.**
2. **Vibrating presser bar thumbscrew.**
3. **Needle bar.**
4. **Vibrating presser bar.**
5. **Presser bar.**
6. **Presser foot.**

Figure 11-22.—End of machine, showing oiling points.

Loosen the setscrew in the needle bar and slip the needle up into the bar as far as it will go. The needle must be inserted with its long thread groove toward the left; the eye of the needle being directly in line with the machine bed. Retighten the setscrew.

Threading the Machine

Pass the thread from the thread stand from back to front through the lower hole (1, fig. 11-25) in the thread post on top of the machine, then from right to left through the upper hole (2) in the post. Pass the thread down through hole (3), up through hole (4), and down through hole (5) in the thread guide on the front of the machine. Continue the thread over from right to left between the tension disks (6), and down, from right to left around the thread controller (7). Then the thread should go up into the fork (8) in the thread controller disk against the pressure of the wire controller. The thread is then passed up through the thread guide (9), and from right to left through the hole in the thread takeup lever (10).

Pass the thread down through the thread guide (11), and between the felt pad and the felt pad retainer finger (12). (If the machine you are threading does not have the felt pad and retainer finger installed, bypass this component.) Finish the threading by passing the thread down through the thread guide (13), through the thread guide (14) at the bottom of the needle bar, and from left to right through the eye of the needle (15). Always thread a needle toward the bobbin.

Removing the Bobbin

To remove the bobbin draw out the right-hand slide plate in the bed of the machine. Insert the fingernail of the forefinger under the latch, raise the latch, and lift the bobbin out. (See fig. 11-26.)

Winding the Bobbin

To wind the bobbin and adjust the bobbin winder, follow the procedure given for the 31-15 sewing machine.

Replacing the Bobbin and Threading the Bobbin Case

Hold the bobbin between the thumb and forefinger of the right with the thread drawing out on the bottom from left to right. Place the bobbin on the center stud of the bobbin case, then push down the latch.

Draw the thread into the slot (1), and under the back of the projection (2). Leave a loose end of thread about 2 inches long above the slide. When closing the slide plate, leave just enough space for the thread to pass through when it is first picked up by the needle.

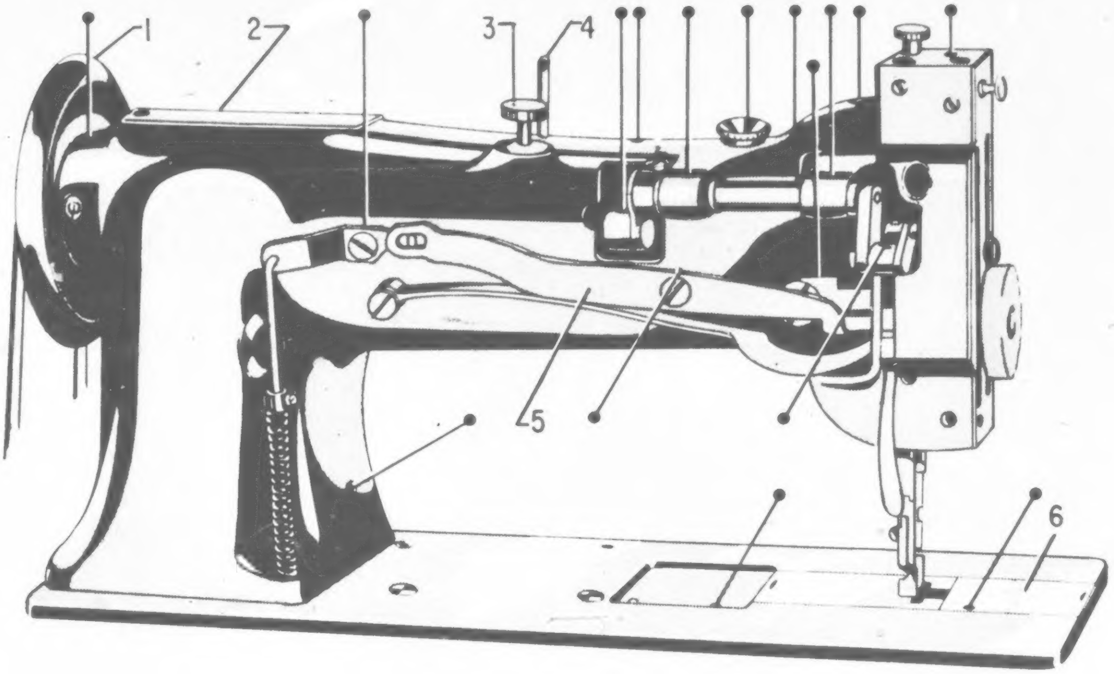


Figure 11-23.–Rear of machine, showing oiling points.

Regulating the Tension

The tension on the needle thread is regulated by the tension thumb nut located at the front of the tension disks on the front of the machine. To increase the tension, turn this thumb nut clockwise. To decrease the tension, turn the thumb nut counterclockwise.

The tension on the bottom (bobbin) thread is regulated by means of the small screw nearest the center of the tension spring on the outside of the bobbin case, as shown in figure 11-26. To increase the tension, turn this screw clockwise. To decrease the tension, turn the screw counterclockwise.

Regulating the Length of Stitch

The number of stitches per inch is stamped on the stitch indicating disk which can be seen through the hole on the uprise.

To change the length of stitch, press down the feed regulating stud (plunger), located in the bed of the machine. At the same time turn the balance wheel slowly until the plunger enters a notch in the adjustable feed eccentric disk. Continue to hold the plunger and turn the balance wheel forward or backward until the number of stitches per inch desired can be seen through the hole in the front of the uprise. Disengage the plunger by releasing it.

Regulating the Pressure on the Material

The pressure on the material is regulated by the presser bar regulating screw at the back of the sewing machine. The screw acts on a flat spring. To increase the pressure, turn this screw downward. To decrease the pressure, turn this screw upward. The pressure should be only heavy enough to enable the feed to move evenly along whatever thickness of material you are using.

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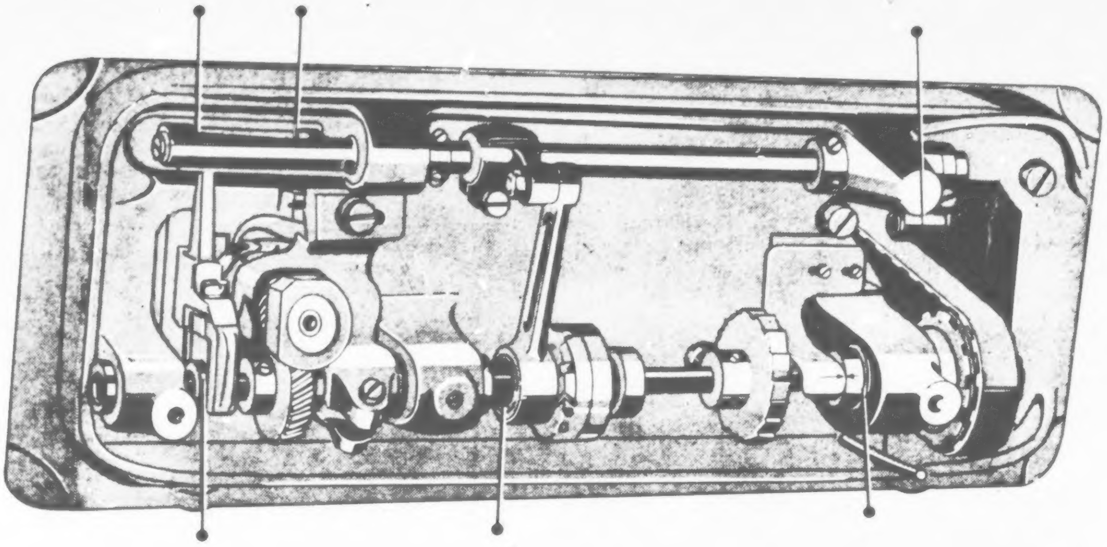


Figure 11-24.—Base of machine, showing oiling points.

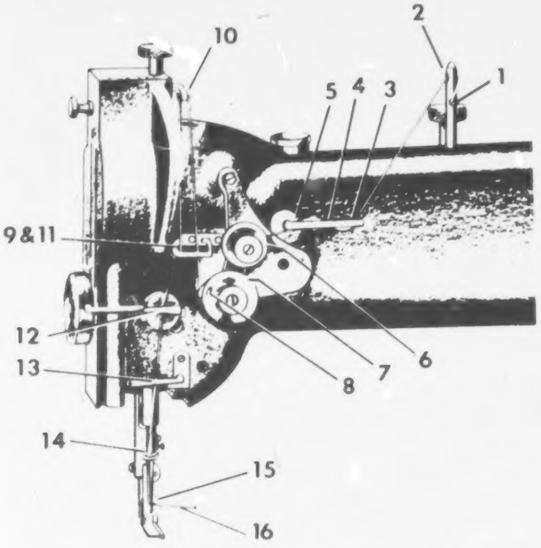
Table 11-3. —Data for class 111 sewing machines.

Sewing Machine	Stitches per minute	Stitches per inch	Needle class and variety	Needle size range
111 W 150	3,500	5 to 32	135 x 7	7 to 24
111 W 151	3,500	5 to 32	135 x 17	14 to 26
111 W 152	2,900	5 to 32	135 x 17	12 to 24
111 W 153	2,900	5 to 32	135 x 17	12 to 24
111 W 154	2,900	5 to 32	126 x 11	22 to 27
111 W 155	3,500	3 1/2 to 32	135 x 17	12 to 24

Preparing for Sewing

With the left hand, hold the end of the needle (machine) thread, leaving it slack from the hand to the needle. Turn the balance wheel over toward you until the needle moves down and up again to its highest position. If the sewing machine is properly timed, this will bring the bobbin thread up with the machine thread through the hole in the feed dog. Lay the threads back under the presser foot and close the slide.

Place the material under the presser foot. Lower the presser foot either by hand or by the



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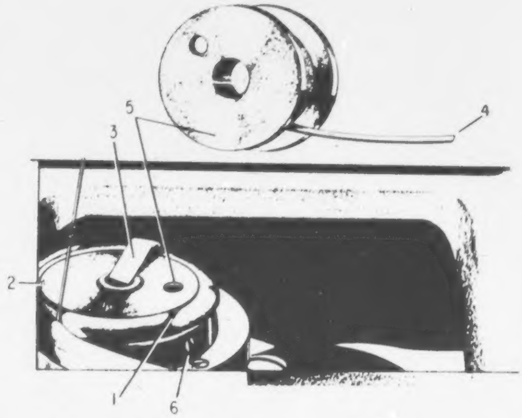
1. Lower hole in thread post.
2. Upper hole in thread post.
3. Hole in thread guide.
4. Hole in thread guide.
5. Hole in thread guide.
6. Tension disks.
7. Thread controller
8. Fork in the thread controller.
9. Thread guide.
10. Thread takeup lever.
11. Thread guide.
12. Felt pad and retainer finger.
13. Thread guide.
14. Thread guide.
15. Eye of needle.
16. Free end of thread.

Figure 11-25.–Threading the class 111 sewing machine.

knee lift, and commence to sew. Start the sewing by turning the balance wheel over toward you as you depress the treadle.

Removing the Work

After the machine has stopped, move the thread takeup lever to its highest position. Raise the presser foot, draw the work back, and cut the threads close to the material. Lay the ends of the threads back under the presser foot.



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1. Slot in the bobbin case.
2. Projection on the bobbin case.
3. Bobbin case latch.
4. End of bobbin thread.
5. Bobbin.
6. Tension adjusting setscrew.

Figure 11-26.–Bobbin case threaded.

SINGER SEWING MACHINE 112 W 140

The 112 W 140 sewing machine has two needles, two gear-driven rotary sewing hooks, and makes the lockstitch. It has a compound feeding mechanism, consisting of needle and drop feed. This machine is designed for stitching flight suits, coats, and other light and medium weight fabrics requiring a compound feed.

For bulky work such as tents, awnings, etc., which require two simultaneous parallel rows of lockstitching, the 112 W 116, equipped with a puller feed, is recommended.

Needles for machine 112 W 140 are of class and variety 135 x 7 and are made in sizes from 12 to 24.

When the machine is new, it should not be driven at a speed exceeding 3,000 stitches per minute. After the first few days, the machine may be driven at its recommended maximum speed of 3,500 stitches per minute. This speed depends on the nature of the work and the ability of the operator.

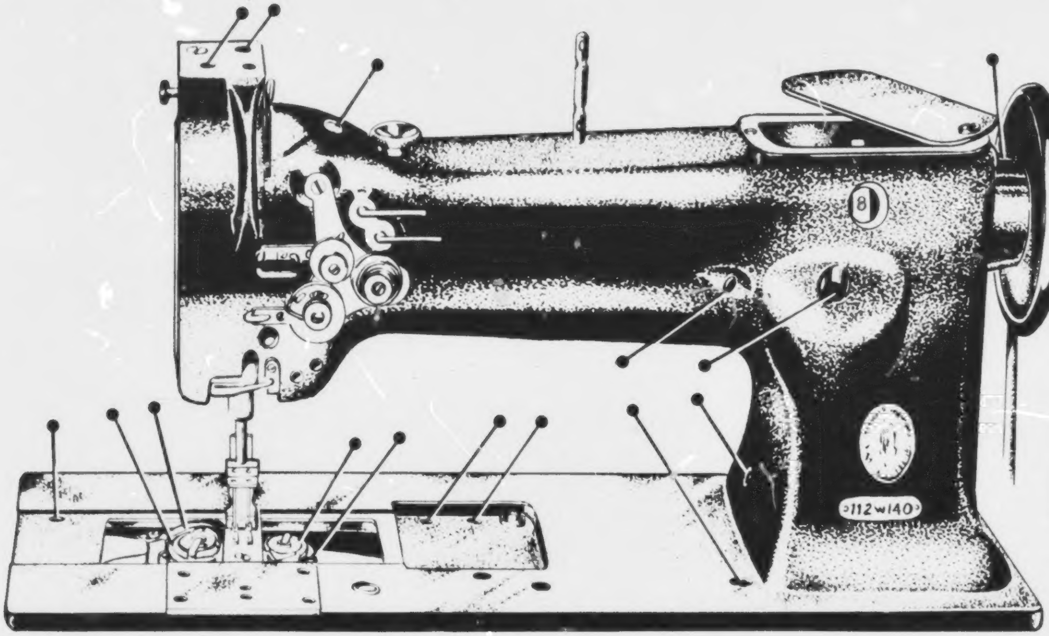

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Figure 11-27.–Oiling points at the front of the machine.

Lubrication

All the parts of the 112 W 140 sewing machine can be oiled without turning the machine back on its hinges. Oil should be applied to each of the places designated by arrows in figures 11-27, 11-28, and 11-29.

The type of oil to be used and the intervals of oiling are the same as given for the 111 series sewing machines.

The hook is lubricated as shown in figure 11-30. Oil should be placed in the oil well as indicated. The oil will flow to both the upper and lower bearings and also lubricate the mechanical opener mechanism.

The small green felt pads on the side of each bobbin case should be kept wet with oil to lubricate the hook races. When these pads are wet, they appear nearly black; when they appear light green, it indicates they are dry. When a machine is new, oil should be applied to these felt pads each time a bobbin is replaced.

Setting the Needles

Turn the balance wheel over toward you until the needle bars and the thread takeup lever moves to its highest position. Loosen the setscrew in the needle holders and slip the needles up into the holder as far as they will go. Make sure the inside needle (one nearest the upright part of the arm) has its long thread groove toward the left. The outside needle (one farthest from the upright part of the arm) must have its long thread groove toward the right. The eyes of both needles must be directly in line with the machine bed. After alining the needles, tighten the setscrews.

Replacing the Bobbins and Threading the Bobbin Cases

The removal and winding of the bobbins is accomplished the same as for the 111 sewing machines. Both bobbins should be wound and replaced at the same time.

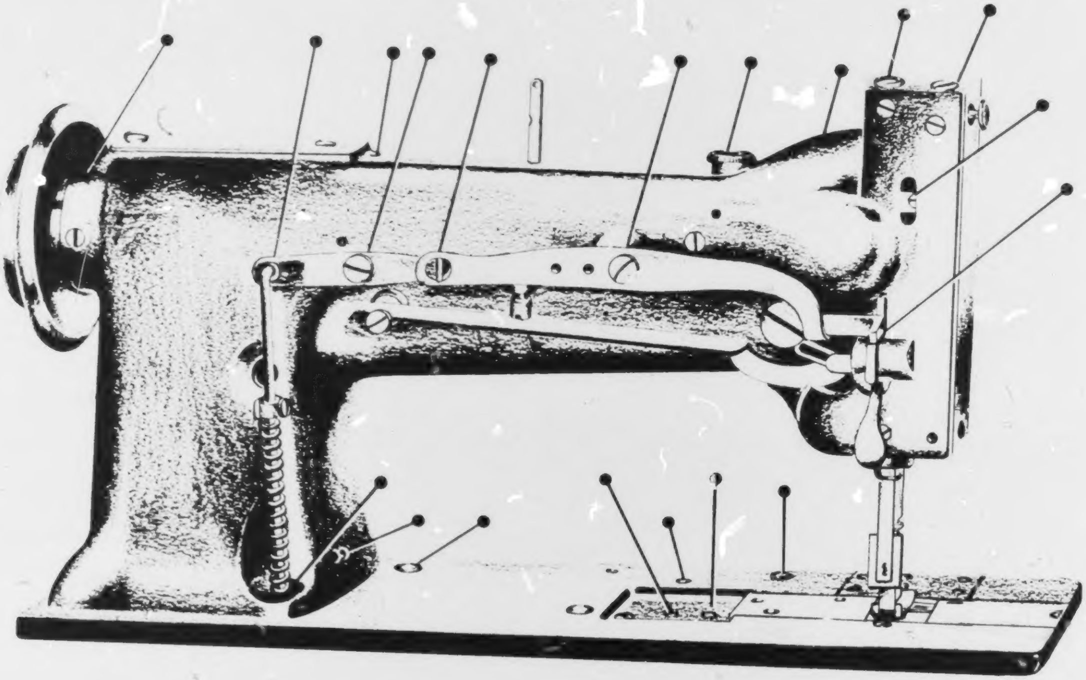


Figure 11-28.—Oiling points at the back of the machine.

The following instructions apply to both of the bobbin cases.

Hold the bobbin between the thumb and forefinger of the right hand, the thread drawing on the bottom from left to right. Place the bobbin on the center stud of the bobbin case then push down the latch, as shown in figure 11-31.

Draw each thread into the slot (1) located in the edge of the bobbin case, and back of the projection (2). Leave a loose end of each thread about two inches long above the slide. When closing the slides, leave just enough space for the threads to pass through when being picked up by the machine threads.

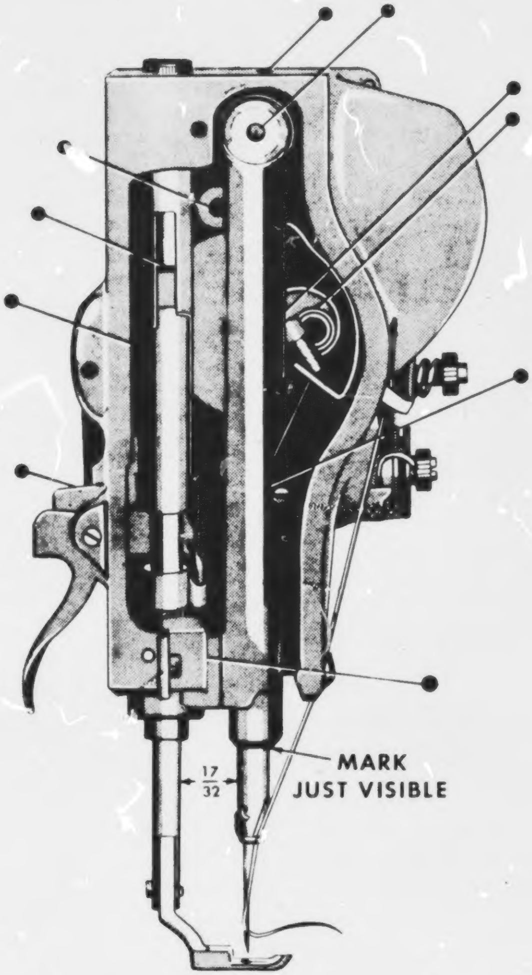
Threading the Machine

The 112 W 140 sewing machine is threaded in practically the same way as the 111 series machines. The only exception is that there are two upper thread guides and two tension disks, as shown in figure 11-32. With the exception of the upper thread guides and tension disks, the two threads run parallel. Each needle is threaded from inboard to outboard (always toward the bobbin).

After the machine has been threaded, the preparation for sewing and removal of the work are the same as for the 111 series machines. Adjusting the tensions, regulating the length of stitch and regulating the pressure on the material are also accomplished the same as for the 111 sewing machine.

SINGER SEWING MACHINE 143 W 2 AND 3

The zigzag sewing machine is an excellent sewing machine for the manufacture of parachutes. This type of machine is not as common as those previously described, but it has unlimited uses in the repair and maintenance of

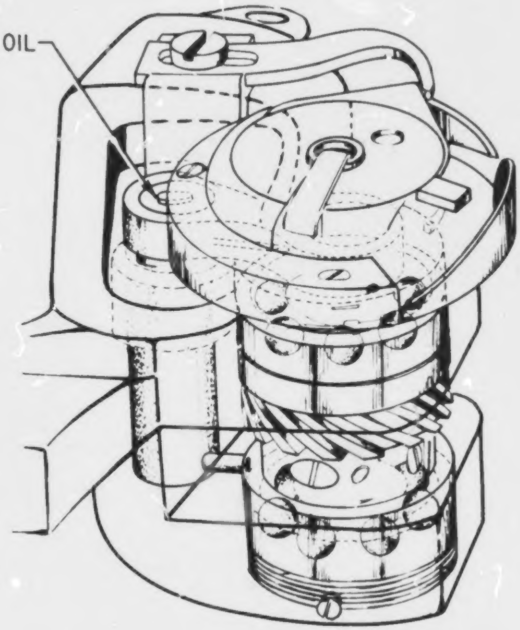


PR.289

Figure 11-29.—Oiling points at the end of the machine.

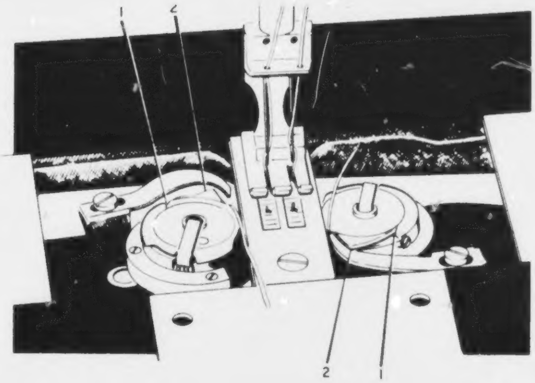
parachutes and survival equipment and will be found in many parachute lofts.

The 143 W 2 is a high-speed sewing machine which has an aluminum alloy vibrating needle bar frame and a rotary hook. It is intended for overseaming and zigzag stitching on fine and general fabrics and lightweight leather. It has ball bearings on the rear end of the arm shaft and hook driving shaft. The needle bar has a maximum throw of 3/16 inch, vibrating both sides of a centerline.



PR.290

Figure 11-30.—Hook lubrication.

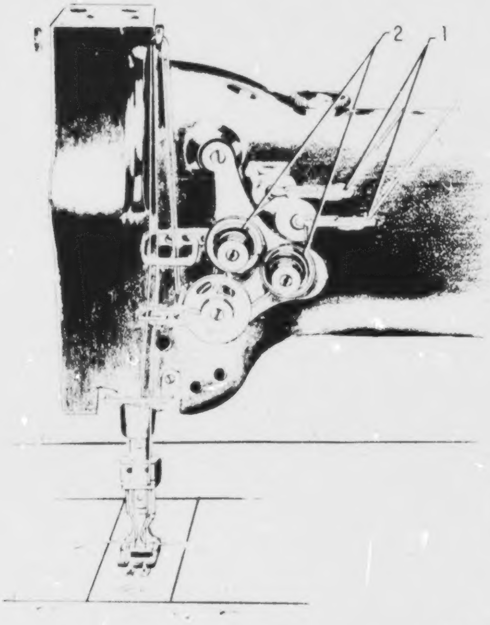


PR.291

1. Slot in the edge of the bobbin case.
2. Projection on the side of the bobbin case.

Figure 11-31.—Threading the bobbin case.

The 143 W 3 sewing machine is similar to the 143 W 2 except that the needle has a maximum throw of 5/16 inch.



PR.292

1. Upon thread guides.
2. Tension disks.

Figures 11-32.–Threading the 112 W 140 sewing machine.

The maximum speed recommended for machine 143 W 2 is 3,500 stitches per minute, and for machine 143 W 3, 3,000 stitches per minute, the speeds depending on the material being sewn.

Lubrication

Lubrication points for these machines are indicated by arrows in figures 11-33 through 11-36. When in continuous use, they should be oiled twice a day.

Needle and Thread

The needles for the 143 W 2 and 3 sewing machines are of class and variety 135 x 7; the sizes from 7 to 24.

Left twist thread should be used on these machines. To make a smooth even stitch with the sewing machine, use good, firmly twisted and smoothly finished thread. The thread should pass freely through the eye of the needle.

Setting the Needle

Push the needle up in the needle bar as far as it will go, with the LONG THREAD GROOVE TO THE FRONT, and secure it firmly with the setscrew. It may be necessary to turn the needle slightly to the right or left for some threads if stitches are missed.

Bobbin and Bobbin Case

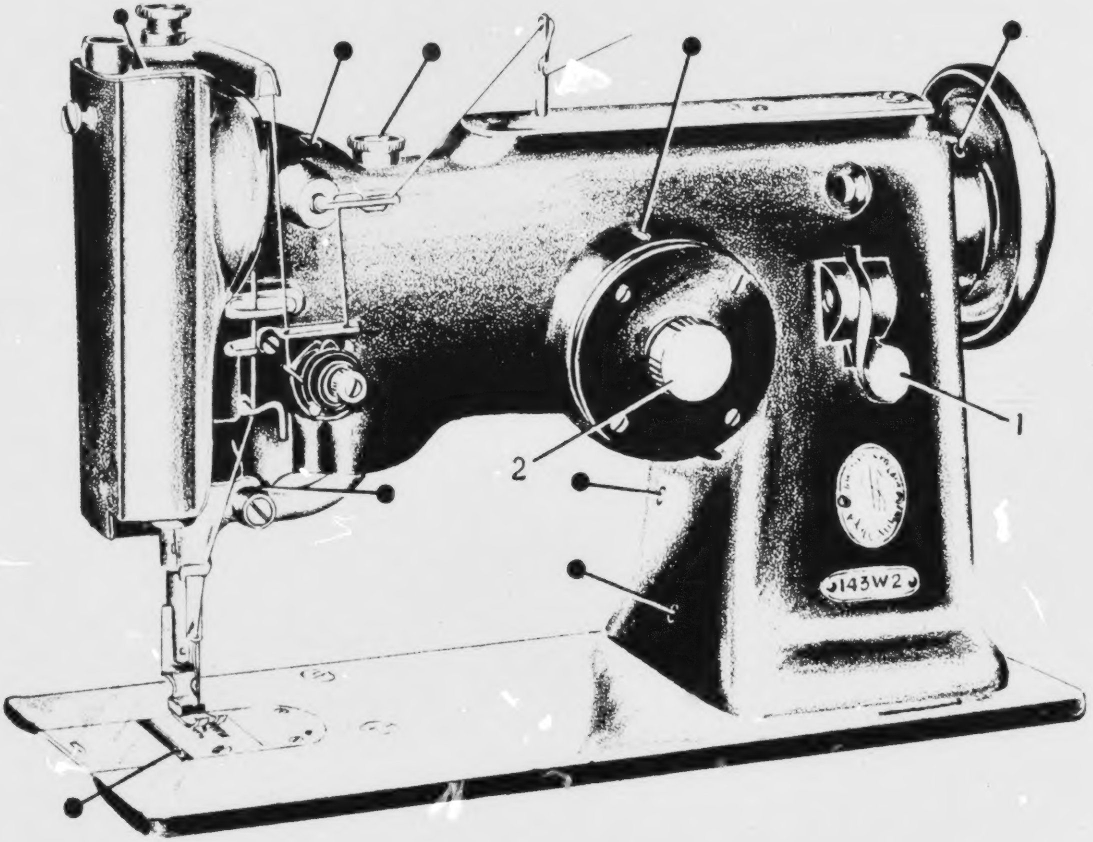
The procedure for removing the bobbin case, winding the bobbin, threading the bobbin case, and replacing the bobbin case is the same as for the 31-15 sewing machine. The only exception to this is that when threading the bobbin case, the thread should draw from the BOTTOM from left to right, instead of from the top as given for the 31-15.

Threading the Needle

These machines are threaded in the same way as the 111 series machines, described earlier in the chapter. When threaded up to the needle, thread the needle from the front through the eye to the back. The long thread groove should be in front when the needle is properly set in the needle bar.

Regulating the Length of Stitch

Press the stitch regulator lever and at the same time turn the balance wheel over toward you until the lever engages the notch in the stitch regulator flange. Continue to hold the lever in the notch in the flange and at the same time turn the balance wheel backward or forward, as required. When the desired number of stitches is obtained, as indicated on the stitch regulator flange (seen through small holes on the upright above the lever), release the lever.



PR.293

1. Stitch regulator lever.
2. Vibrator regulating spindle head.

Figure 11-33.—Oiling points at front of machine.

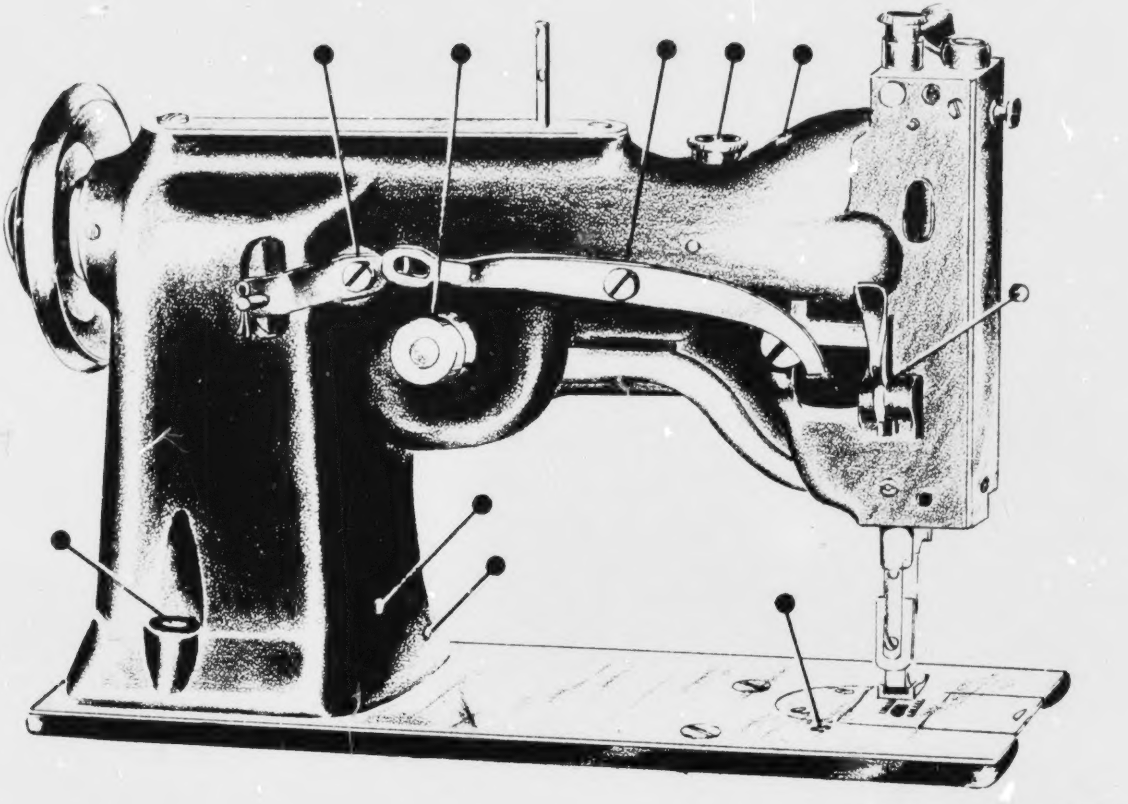
Regulating the Width of Throw

The width of throw of the zigzag stitch is regulated by means of the needle vibrator regulating spindle head on the front of the machine. To increase the width of the zigzag stitch, turn the regulating spindle head counterclockwise. To decrease the width of the zigzag stitch, turn the regulating spindle head clockwise.

The thread tensions are regulated as given for the 111 class machines, and the pressure on the material is regulated by the thumbscrew, located on top of the sewing machine face.

Turning Corners

Stop the machine while the needle is rising, but before it is out of the material, raise the presser foot and turn the work. This method uses the needle as a pivot.



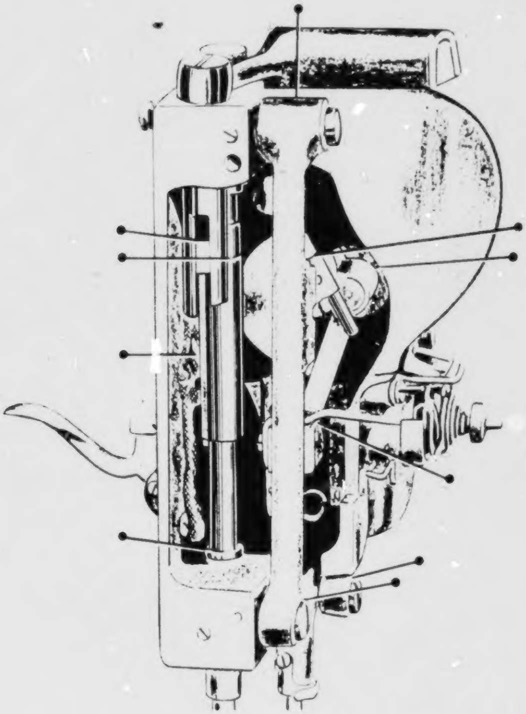
PR.294

Figure 11-34.–Oiling points at back of machine.

Removing the Work

Raise the presser lifter (either hand or knee), turn the machine by the balance wheel until the takeup lever is at its highest position and draw the work away from you. If the threads do not draw out easily, the takeup lever is not in the right position. If the machine is stopped as directed, the needle will not be unthreaded when starting to sew, even if only a short end is left through the eye of the needle.

Service manuals covering each class and variety of sewing machines are furnished with new machines. Replacement manuals may be ordered, through open purchase, from the sewing machine manufacturer. Servicing of all sewing machines is to be performed in accordance with the applicable sewing machine maintenance manual. Adjustments to sewing machines must be made only by qualified personnel.



PR.295

Figure 11-35.—Oiling points at end of machine.

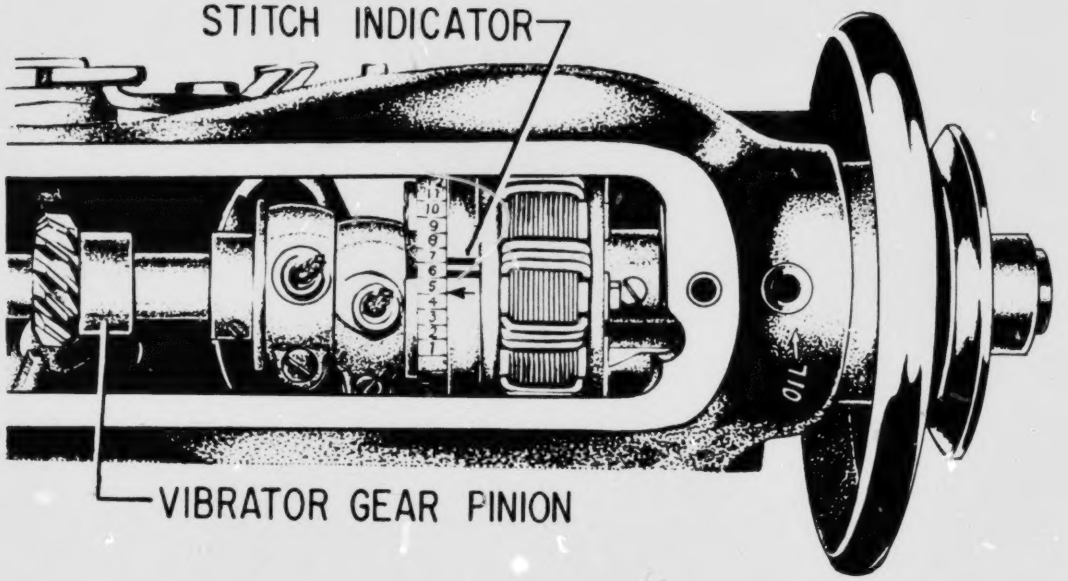

STITCH INDICATOR
VIBRATOR GEAR PINION
OIL
PR.296

Figure 11-36.–Oiling points at top of machine.

CHAPTER 12

FASTENERS

Textile products may be joined by many different methods, depending upon each individual requirement. These methods include sewing (by hand, or by machine), cementing, and the use of various fasteners and fastening devices.

Fasteners have been designed for almost every possible manner in which textile products may be united. Some fasteners act as anchoring and reinforcing points for pockets and corners, while others are snaps, and release their grip when pulled in the proper manner.

The PR must be thoroughly familiar with—and able to repair or renew—each type fastener. These fasteners include:

1. Snap fasteners.
2. Speedy rivets.
3. Grommets.
4. Slide fasteners (zippers).
5. Hook and pile tape.

SNAP FASTENERS

The snap fasteners most commonly used in the manufacture of parachutes and for general utility work in the parachute loft are described in the following paragraphs.

WIRE SPRING CLAMP TYPE FASTENERS

The wire spring clamp type fastener is furnished in two sizes, regular (MS 27980) and small (MS 27981). In the parachute loft the wire spring clamp fastener is popularly called DURABLE DOT or DURA DOT. Figure 12-1 shows the parts of the regular wire spring clamp type fastener. In comparison to the regular size, the button of the small wire spring clamp type fastener has a dimension of 17/32 inch, with smaller corresponding parts.

Both the regular and the small wire spring clamp type fasteners are designed with a strong grip, and they will release or separate when pulled in any direction. The regular size wire spring clamp is the one most frequently used. It is used in the manufacture of back pads and parachute containers. It is also used on flight clothing where the additional security offered by the THREE-WAY SNAP is not needed. Military Standards refer to the parts of this fastener as button, socket, stud, and eyelet.

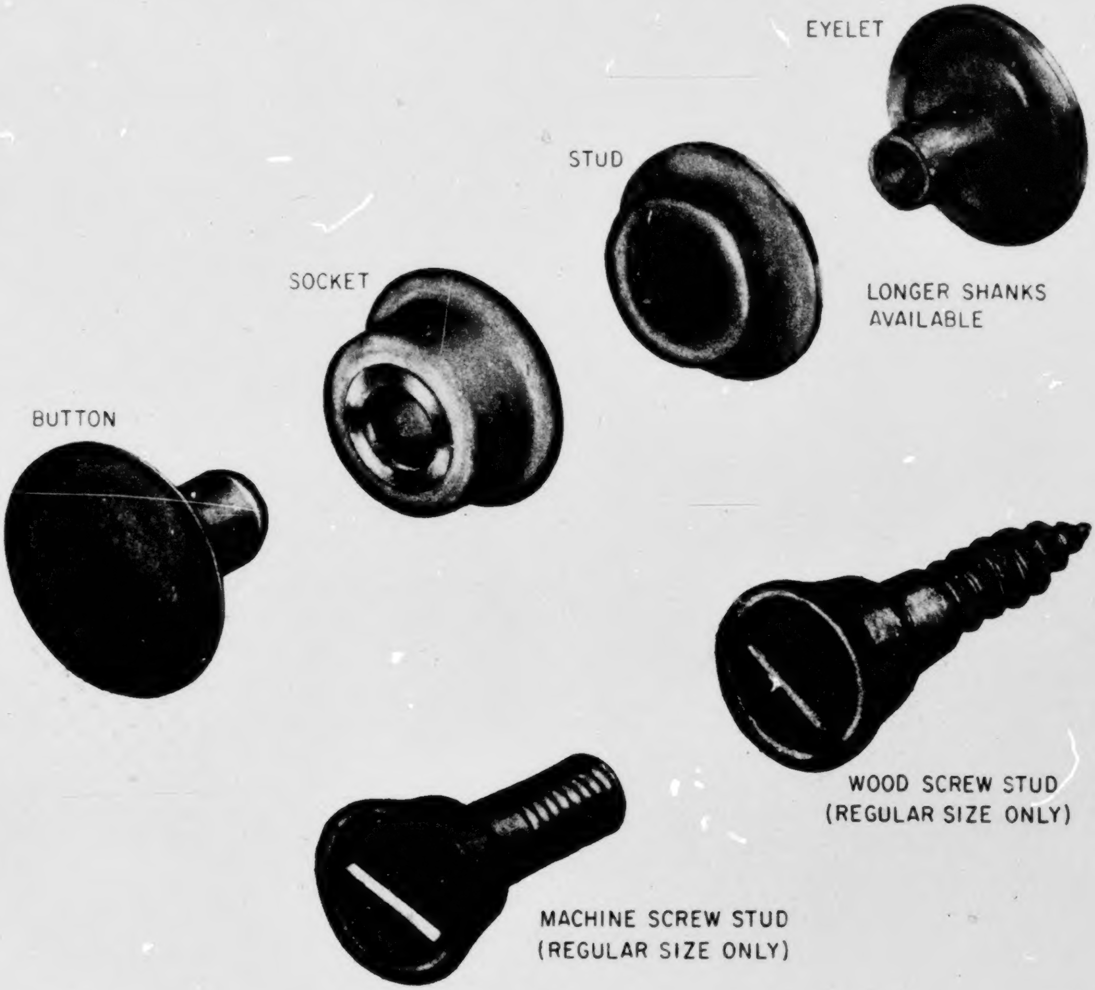
All parts are plated. Notice the difference in the studs in figure 12-1. These studs make it possible to mount the fastener in fabric, wood, or metal.

THREE-WAY LOCKING SNAP TYPE FASTENERS (MS 27983)

The three-way snap is manufactured in one size only, regular, and is used on flight clothing, parachute containers, and back pads. (See fig. 12-2.) This fastener will open only when lifted from the side with the dot. It is therefore not used where any quick opening devices or quick releasing action is required. For example, the lift web keepers of a seat type parachute are equipped with the regular wire spring clamp fastener, while the two vertical keepers, which hold the shoulder straps and the back strap, are fitted with three-way locking snaps.

CURTAIN TYPE FASTENERS (MS 37977)

The curtain type fastener (lift-the-dot) is manufactured in two sizes, large and small. The parts of the large lift-the-dot, with various types of studs, are shown in figure 12-3. These fasteners have many uses, especially for truck and boat covers. The small lift-the-dot is the same as the large one, and designed on a smaller scale for use on lighter work where the bulkiness and weight of the large lift-the-dot are not desired.


EYELET
STUD
LONGER SHANKS AVAILABLE
SOCKET
BUTTON
WOOD SCREW STUD (REGULAR SIZE ONLY)
MACHINE SCREW STUD (REGULAR SIZE ONLY)

PR.297

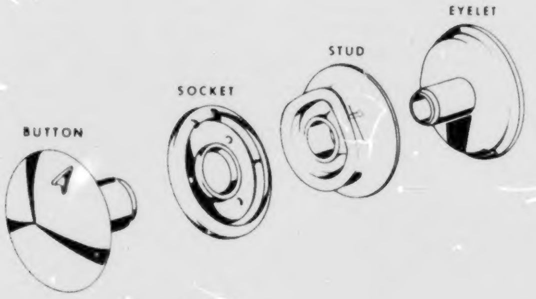
Figure 12-1.—Regular wire spring clamp fastener.

GLOVE SNAP TYPE FASTENER (MS 27977)

Figure 12-4 illustrates this type fastener, which is generally used on lightweight flight clothing.

INSTALLATION OF SNAP FASTENERS

Figures 12-5 through 12-7 illustrate the methods and tools employed in the installation of the regular wire spring clamp type fastener,



PR.298
Figure 12-2.—Three-way locking snap type fastener.

large curtain type fastener, and the glove snap type fastener.

Setting Tools

In order to properly install the various types of fasteners used in the work center, it is essential to use the proper tools (chucks and dies) for the fastener being installed.

Fasteners and grommets are procured through normal supply channels. Each part of every fastening device has a separate Federal Stock Number. Therefore, if a complete fastening device is composed of four parts, it is essential that each part be ordered individually by its assigned FSN.

The attaching chuck and die tools, cutting tools, and hand press, used for setting grommets, are obtained by means of an "Open Purchase" order.

GROMMETS

The grommet is an eyelet, made of metal, rubber, or fabric. It is used as a reinforcement around a hole or cut, usually on the edge of an item where lacing or similar fastening is required. Examples of these are lacings on tent flaps and locations for securing the side flaps on parachutes.

The types of grommets most commonly found in a parachute loft are the plain grommet and the spur grommet. (See fig. 12-8 (A).) The plain grommet is used in lightweight materials, where there will be very little stress. The spur grommet is designed with teeth in the outer ring of the washer to aid in holding in heavy or loosely woven fabric and in places where considerable stress will be placed on the grommet. Design specifications for grommets are found in Military Standards 20230.

The grommet used on parachute side flaps is a plain type, specially manufactured of chrome-plated metal. It is set in the parachute side flaps under a process which fuses the edge of the hole in the material and prevents the circular cut from fraying. This type of grommet is shown in figure 12-8 (B).

Grommets may be set either by hand or by the hand press. The hand press makes a neater job and should be used whenever possible. Figure 12-9 illustrates the hand press dies and chucks used to set a plain or spur grommet. When setting grommets, the material should be reinforced with a hem or patch before the grommet is set.

SPEEDY RIVETS

Speedy rivets may supplement stitching as an additional reinforcement. One very popular use is in the open corners or pockets of certain types of clothing. They are also used to join two pieces of fabric or to secure a loop in a leather belt.

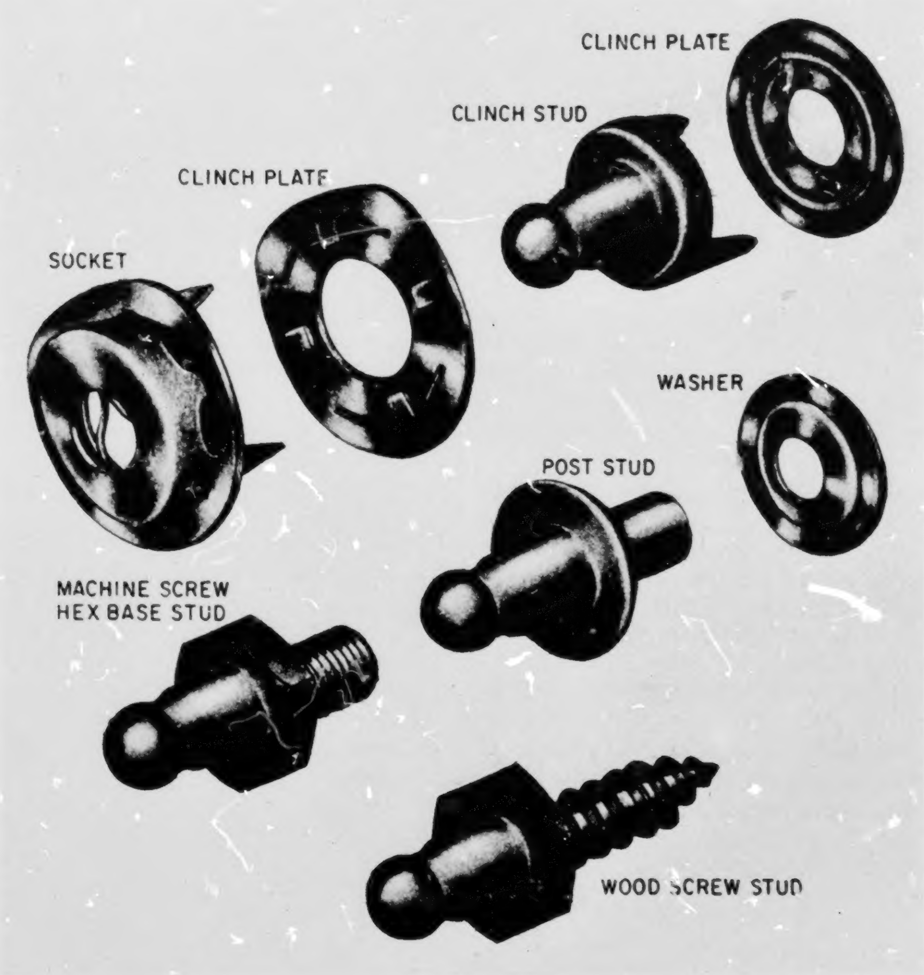
REMOVING FAULTY FASTENERS

Fasteners may be removed by different methods. The method used depends on the type fastener being removed, the material from which the fastener is being removed, and the person doing the job.

SNAP FASTENER REMOVAL

A damaged snap fastener is removed by cutting the shank or post securing the socket of one half and the stud of the other half. A sharp pair of end cutting pliers will do the job easily; however, considerable care must be taken to prevent cutting the fabric between the crimped shanks or extensions.

Some PR's prefer to drill the fastener out, and in some cases where the material is brittle or otherwise easily damaged, this is the better


CLINCH PLATE
CLINCH STUD
CLINCH PLATE
SOCKET
WASHER
POST STUD
MACHINE SCREW HEX BASE STUD
WOOD SCREW STUD

PR.299

Figure 12-3.—Large curtain type fastener (lift-the-dot).

method. However, the fastener must be secured in some manner to prevent it from turning and tearing the fabric during the drilling.

GROMMET REMOVAL

Grommets are removed by prying the shank away from the washer until the shank is uncrimped enough to permit the washer to be withdrawn. They may also be removed by cutting the shank with a chisel. This raises the washer enough to permit gripping it with a pair of pliers for removal of the washer.

SPEEDY RIVET REMOVAL

Use a pair of diagonal cutting pliers to remove a speedy rivet. Cut the crimped shank halfway between the two parts, taking care not to damage the fabric.

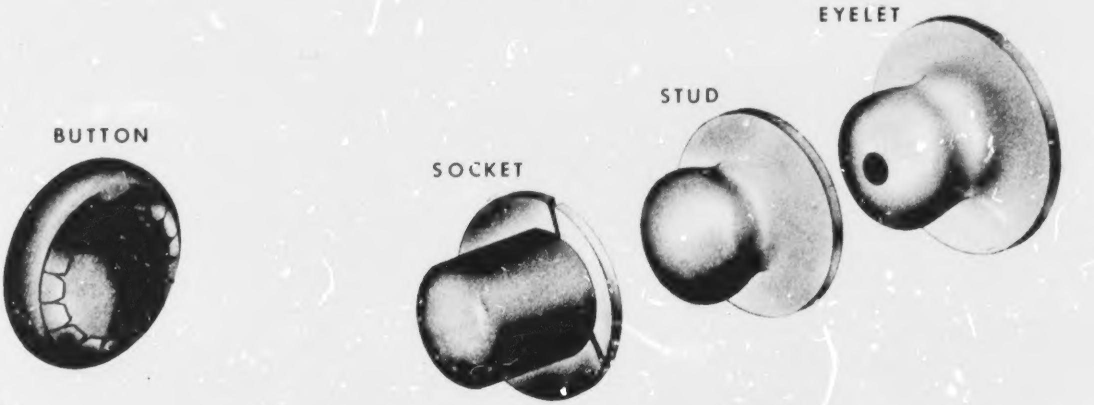


Figure 12-4.—Glove snap type fastener.

SLIDE FASTENERS

The types of slide fasteners (zippers) used on flight clothing and other items of aviation equipment are shown in figure 12-10. Figure 12-11 shows the parts of a slide fastener.

SLIDE FASTENER CONSTRUCTION

A slide fastener consists of two rows of teeth (hollow cones or scoops) facing each other. When brought together at the proper angle, each tooth is designed to fit within the tooth opposite

When closed, the slide fastener teeth cannot be parted except through use of the slider which, when moved, displaces teeth at the proper angle for meshing and unmeshing.

The small clips (stops) at the top and bottom of the slide fastener are designed to prevent the slider from running off the track. Separating type slide fasteners do not have a bottom stop, but are equipped with a pin and retainer arrangement to facilitate separating of the slide fastener.

SLIDE FASTENER OPERATION

Ordinary slide fasteners are designed for flat, smooth operation, and both hands are required for proper functioning. The chain should be stretched taut with one hand and the slider worked (without force) with the other.

When operating a slide fastener installed in a garment of soft nappy material, or lined with wool or fur, do so with care to prevent the nap or wool from jamming the slider.

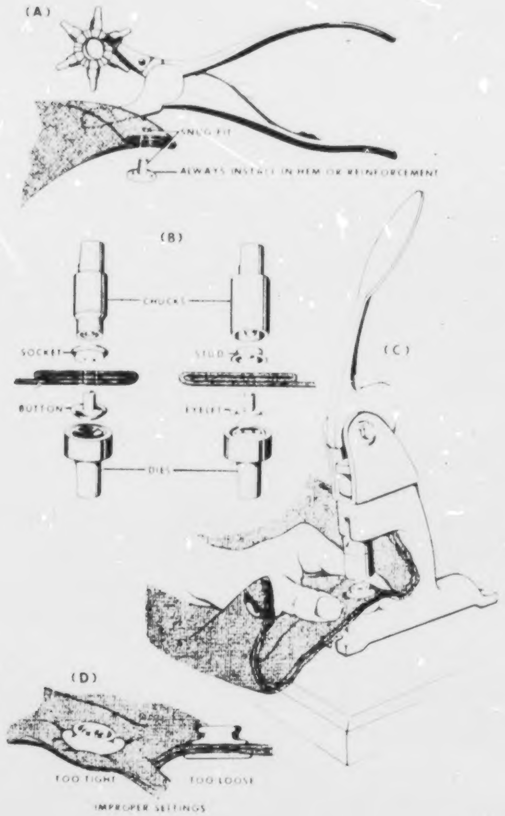
Very often grease or oil deposits lodge between the tiny hollow parts of the teeth and accumulate dirt and lint. This causes stiff operation of the slider. A dirty or gummed chain should be cleaned with an old toothbrush or a pipe cleaner saturated with Stoddard solvent or other similarly approved cleaning solvent. After each cleaning, the chain should be lubricated by applying one drop of oil or a small amount of graphite between the thumb and forefinger and running the chain up and down between the fingers several times.

A brief inspection will determine whether a slider (or pull tab) is the locking or nonlocking type. Always be certain that the pull tab is lifted at right angles to the slider before attempting to remove the locking type. The relative positions of the pull tabs are shown in figure 12-12.

SLIDE FASTENER TOOLS

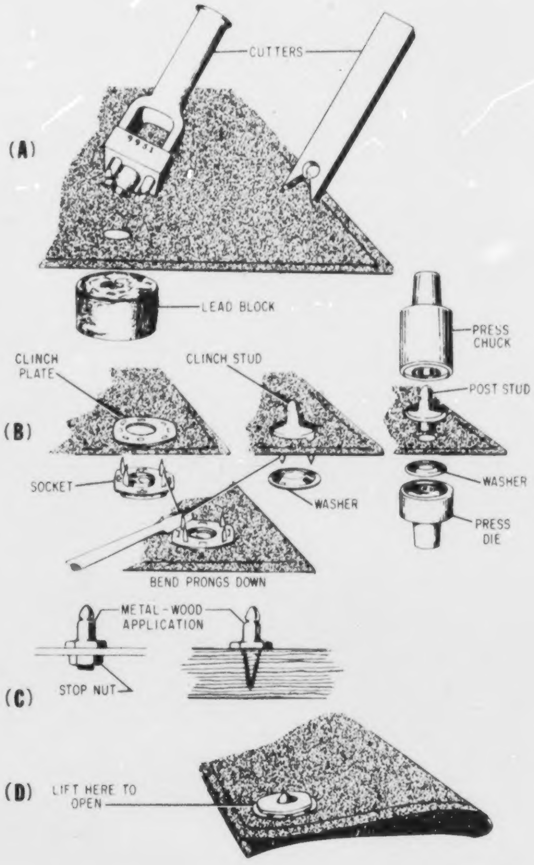
In addition to common tools such as screwdrivers, pliers, awls, knives, scissors, and needles, a well-equipped slide fastener kit should be included in the parachute loft equipment.

The slide fastener kit (zipper repair kit) contains all the parts necessary to repair any size


(A)
SNUG FIT
ALWAYS INSTALL IN HEM OR REINFORCEMENT
(B)
CHUCKS
SOCKET
STUD
BUTTON
EYELET
DIES
(C)
(D)
TOO TIGHT
TOO LOOSE
IMPROPER SETTINGS

PR.301

Figure 12-5.—Installing the regular wire spring clamp type fastener.


CUTTERS
(A)
LEAD BLOCK
PRESS CHUCK
CLINCH PLATE
CLINCH STUD
POST STUD
(B)
SOCKET
WASHER
WASHER
PRESS DIE
BEND PRONGS DOWN
METAL - WOOD APPLICATION
STOP NUT
(C)
(D)
LIFT HERE TO OPEN

PR.302

Figure 12-6.—Installing the large curtain type fastener.

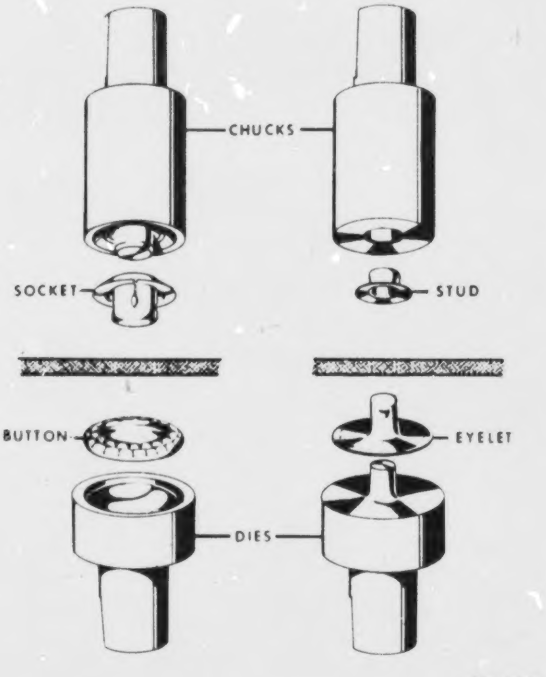
or type slide fastener, plus the following special tools: end cutters, or nippers, used for removing stops and teeth; stop-closing pliers, specially designed to span over the slider and clamp the stops in position; and pull-up pliers, designed to close the slider without a pull tab. Another handy tool in slide fastener repair is an awl with a bent tip. This tool may be used to close the chain by hand.

SLIDE FASTENER REPAIR

A torn or ripped zipper bead cannot be repaired, but should be replaced with a complete new slide fastener. If the bead is damaged near the top or bottom of the slide fastener, and the damaged ends can be cut off to shorten the slide fastener without hampering the usefulness of the garment, an effective repair can be made.

Loose or missing teeth and stops will cause trouble. If teeth or stops are not tightened, they will eventually be lost and tear the bead. In repairing such damage, see that the loose stop is in position (almost touching teeth), then set tightly with stop-closing pliers. Set any loose teeth parallel with the other teeth in the chain, then apply pressure with the stop-closing pliers. If a replacement stop is not available in the repair kit, a soft wire or heavy thread may be used as a temporary stop.

A missing tooth should be repaired by replacing the entire slide fastener. However, in



PR.303

Figure 12-7.—Installing the glove snap type fastener.

the event that there are no spare fasteners available, a missing tooth may be replaced. This is done by carefully removing the stop from the top of the chain, taking off the top tooth, replacing the stop, and setting the tooth in place. (Use caution, do not damage the bead of the chain when resetting the tooth.)

Difficulty may be encountered in moving the slider on the chain. This is caused by the jaws of the slider being too tight, or a dirty chain may be the trouble. To loosen the slider, insert a screwdriver between the jaws, and very gently pry them apart until free operation is effected. A dirty chain is cleaned in the manner described in a preceding paragraph.

Should the slider become jammed with fur, wool, or other material, carefully remove such matter with a pin or needle while gently pulling the slider until it is released. If it is so badly jammed that it resists all efforts, remove the slider by carefully bending the jaws apart and returning the jaws to their original position. The slider is then replaced on the chain, as described later.

Most pull tabs have two small projections fitting into slots on each side of the slider. To remove the pull tab, use two pairs of pliers, one on each side, and twist in opposite directions. In replacing pull tabs, this procedure is reversed. Pull tabs furnished as replacements need only to be squeezed onto the slider.

In making repairs to a damaged slider, the slider must be removed. The proper procedure for removing and replacing a slider on the chain following repairs is explained in the following paragraphs.

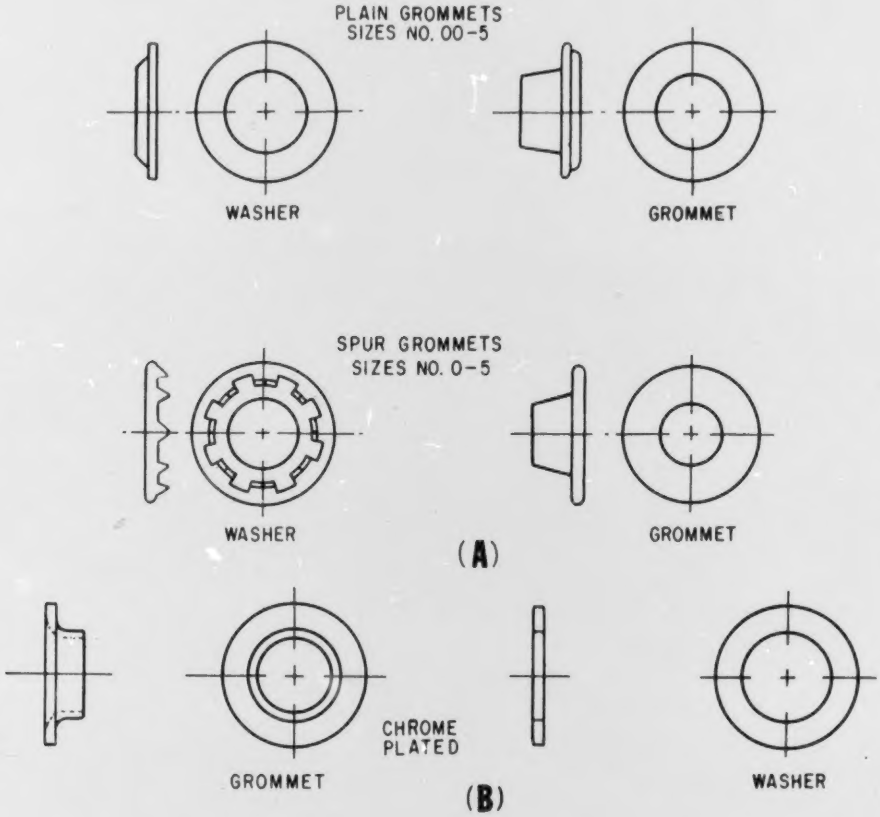
To remove the slider from the regular type slide fastener (nonseparating), carefully rip the stitches from the BOTTOM of the slide fastener to expose the ends of the tape. Then remove the bottom stop, and slip the slider off the bottom of the chain and entirely off the beads and tape, as shown in figure 12-13.

To replace the slider on a regular type slide fastener, thread the two bottom beads into the wide end of the slider. Hold the tape so that the bottom teeth are correctly matched, then draw the slider upward until the teeth mesh for several inches. Without allowing the teeth to separate, clamp the bottom stop close to the teeth and over both beads. Replace the tape ends and ripped stitches by hand or by machine.

To remove a damaged slider on a separating type slide fastener, carefully rip the stitches at the TOP of the slide fastener, on the retainer side only, thus exposing the end of the tape. Remove the top stop, slip the slider off the top of the chain, and completely remove it from the bead and tape. Repair or replace the slider.

To replace the slider on a separating type slide fastener, thread the bead on the retainer side into the narrow end of the slider, and allow the slider to slip down the chain. Replace the tape end and ripped stitches by hand or machine.

To replace the slider on the top of a regular, nonseparating type slide fastener with the aid of pull-up pliers, slip the tool over the bottom stop, clamp together, and pull upward. Close the entire chain in this manner. Thread the two top beads into the narrow end of the slider, holding the teeth meshed until they enter the


PLAIN GROMMETS
SIZES NO. 00-5
WASHER
GROMMET
SPUR GROMMETS
SIZES NO. 0-5
WASHER
(A)
GROMMET
CHROME
PLATED
GROMMET
(B)
WASHER

PR.304

Figure 12-8.–(A) Grommets, plain and spur; (B) grommet and washer used on parachute container.

slider. Replace the top stops, tape ends, and ripped stitches.

Shortening a Slide Fastener

To shorten a slide fastener, first determine the length required. The chain should be about 1/2 inch shorter than the opening in the material or garment. Mark the desired length, measuring from the bottom stop upward. Open the chain to any point below this mark and cut directly across the tape about 1 inch above the mark. Cut the excess teeth from the marking point to the end of the tape, and replace the two stops, crimping them firmly.

Installing a Slide Fastener

The installation of a slide fastener will vary with the type of job. Some will be curved, some around corners, and some hidden. The installation of a straight slide fastener is described in the following paragraphs.

Slide Fastener Presser Foot

In order to install a slide fastener neater and easier, a slide fastener presser foot should be

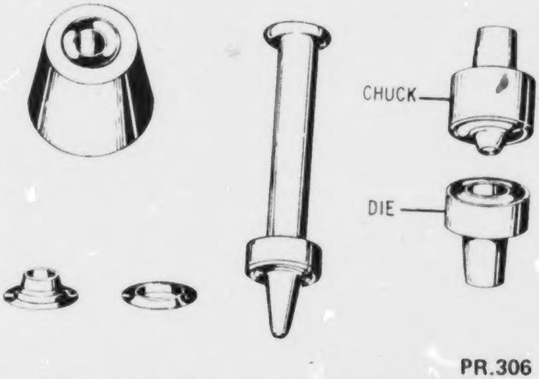


Figure 12-9.—Hand press and grommet hand setting tools.

used on the sewing machine. The slide fastener presser foot will serve not only as a guide for a neat row of stitches, but will also prevent the foot from riding up on the chain.

The sewing machine manufacturer can supply a regular slide fastener presser foot (right or left) for any sewing machine, or one can be made locally. File or grind the left side of an old presser foot to permit sewing to within 1/8 inch of the chain.

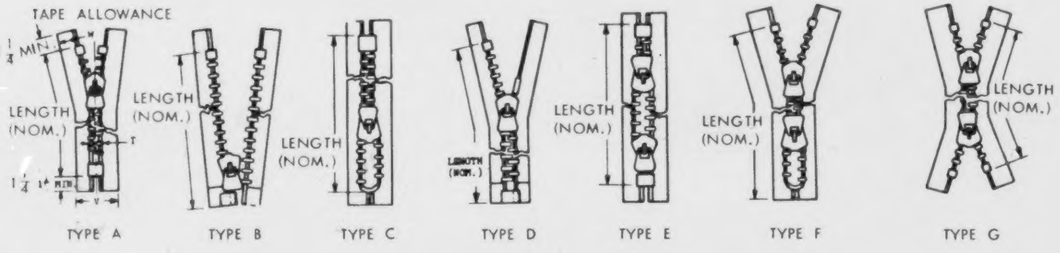
Fabrication

When sewing, always stretch the slide fastener and not the material, as this makes a flatter and neater job.

A simple method of installing a slide fastener when making a bag or cover with two closed ends follows: Lay the piece of material right side down, and place the slide fastener right side down on top of the material where the opening is to be located. Sew a row of stitches completely around the outer edge of the tape, as shown in figure 12-14.

Turn the material over. Then by feeling with the points of a pair of scissors, cut the material directly down the center of the chain and cut a V at each end, as shown in figure 12-15.

Turn the edges of the material under, thus exposing the chain. Allow sufficient space between the chain and the folded edge of the material, to prevent the slider from rubbing the edge of the hems. Cutting the V at each end of the chain permits the sewing of neat, square corners. (See fig. 12-16.)



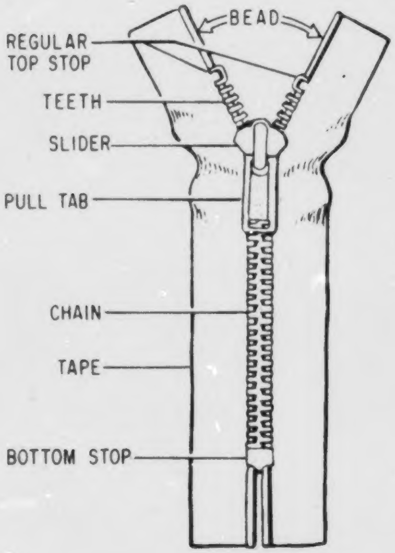
TYPE A - NON-SEPARATING, SINGLE ACTION.
TYPE B - SEPARATING, SINGLE ACTION.
TYPE C - NON-SEPARATING, SINGLE ACTION WITH BRIDGE STOP.
TYPE D - SEPARATING, SINGLE ACTION, QUICK DETACHING.
TYPE E - NON-SEPARATING, DOUBLE ACTION, CENTER OPENING.
TYPE F - NON-SEPARATING, DOUBLE ACTION WITH BRIDGE STOP.
TYPE G - SEPARATING, DOUBLE ACTION, END OPENING.

SIZE 0 - LIGHT SERVICE.
SIZE 1 - LIGHT-MEDIUM SERVICE.
SIZE 2 - MEDIUM SERVICE.
SIZE 3 - MEDIUM HEAVY SERVICE.
SIZE 4 - HEAVY SERVICE.

STYLE S - STANDARD NON-LOCKING.
STYLE L - LOCKING.

PR.307

Figure 12-10.—Slide fasteners.



PR.308

Figure 12-11.—Slide fastener parts.

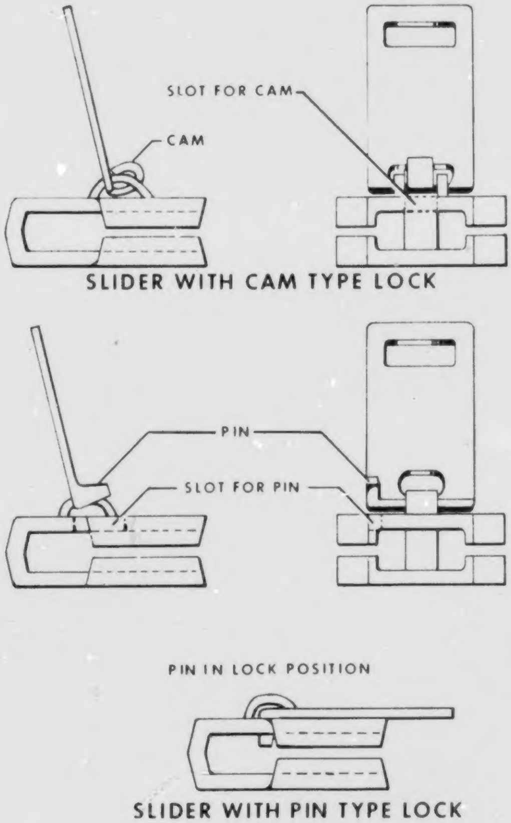
PROCUREMENT OF SLIDE FASTENERS

When requisitioning slide fasteners or slide fastener parts through the supply system, certain specific information is necessary: Type, size, grade, color, style of slider, and unit of issue, are all part of this information.

There are two types of slide fasteners, separating and nonseparating. A nonseparating, Type A slide fastener is used where only a small area needs to be opened; for example, the opening in a parachute bag. A separating slide fastener, Type B, is used in areas where it is necessary to spread the opening for easy access, such as on a jacket or the legs and waist of an anti-g coverall.

The size, or service weight, of a slide fastener to be installed on a fabric assembly will be determined by the weight of the material and the stress that will be applied. The size range and services of slide fasteners are as follows:

1. Size 0–Light service.
2. Size 1–Light to medium service.
3. Size 2–Medium service.



PR.309

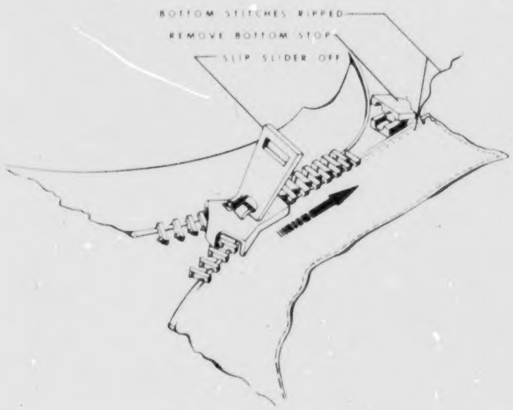
Figure 12-12.—Slide fastener pull tabs.

4. Size 3–Medium to heavy service.
5. Size 4–Heavy service.

Materials used in slide fastener construction vary from plastic and nylon, to cotton, rubber, and metal. There are two common grades of slide fastener chains. Grade I is of brass construction and Grade II is made of other metal alloys or synthetic materials.

In most instances, however, the PR will be concerned with fasteners which have been constructed from cotton fabric and metal parts.

A closely woven cotton fabric is commonly used for the tape of a slide fastener, the color of this tape should be considered for the main fabric color matching when installing a slide fastener.



PR.310
Figure 12-13.—Removing the slider.

On certain items of survival equipment using slide fasteners it is mandatory that the slider remain stationary where it is positioned on the chain. An accidental opening in flight, of an equipment container or item of flight clothing, could cause considerable trouble for the aircrewman.

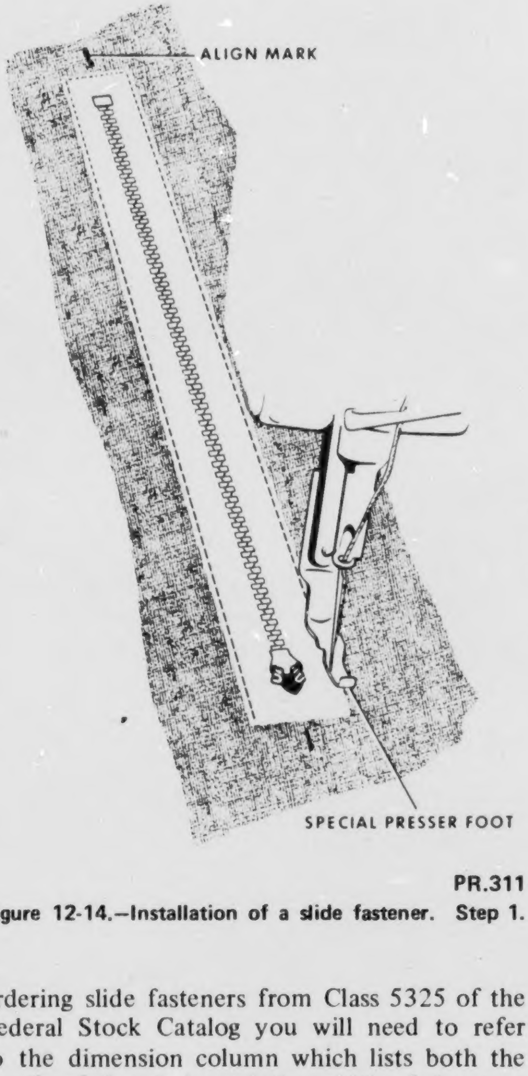
Unintentional opening, of a slide fastener which requires positive security, is prevented by using a locking Style L slider.

Illustrated in figure 12-12 are two common types of locking Style L sliders: the pin type and the cam type. The pin type is designed to lock when the pull tab is pressed flat onto the chain, thereby inserting its pin between two teeth on one side of the chain.

The cam type is also designed to lock when the pull tab is pressed flat onto the chain, thereby causing friction between the chain and the cam. This action prevents any movement of the slider.

Slide fasteners installed where the movement of the slider is not critical may be equipped with a Style S standard nonlocking slider. The Style S slider is normally used on slide fasteners where accidental openings will not create a problem.

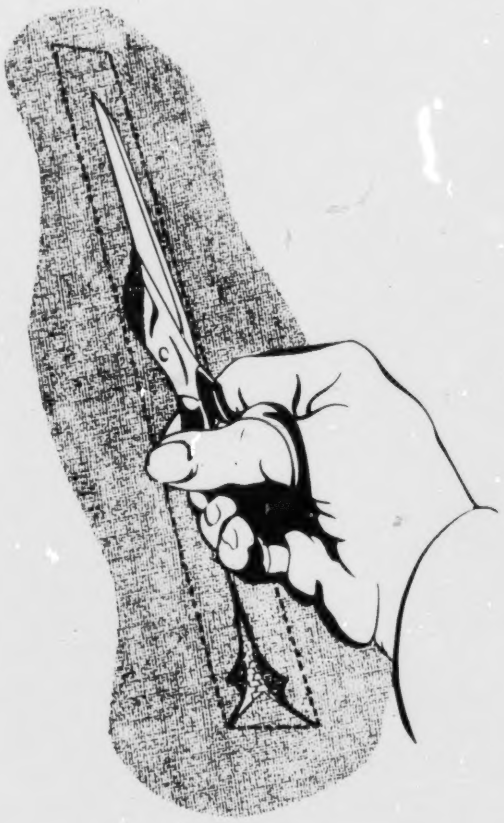
The length of a slide fastener is determined by the amount of closure required. When ordering slide fasteners from Class 5325 of the Federal Stock Catalog you will need to refer to the dimension column which lists both the length of the chain and the width of the tape. The size of a slide fastener is referred to as its service weight.



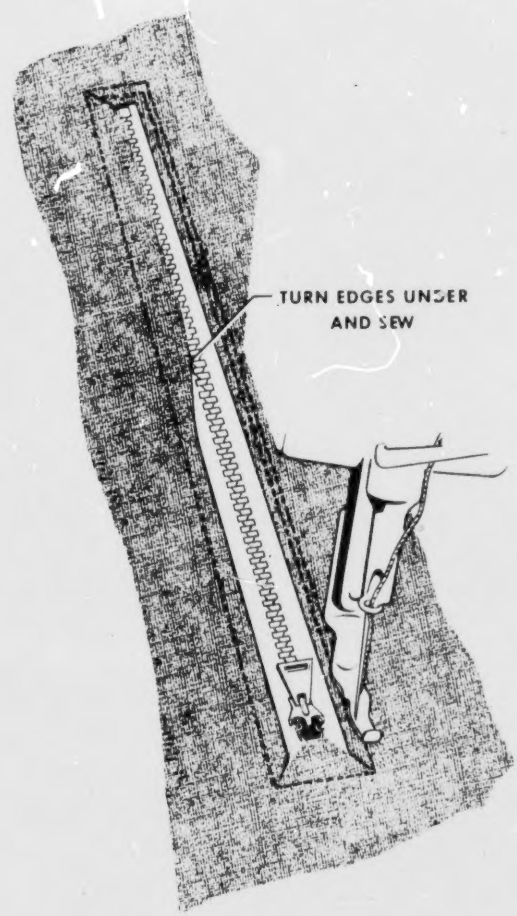
PR.311
Figure 12-14.—Installation of a slide fastener. Step 1.

Activities should specify the brand of chain for which stops and sliders are required. (Talon, Crown, or any other make.)

Slide fasteners in stock will be supplied in the nearest length ordered. When received, the chain should be cut to the desired length; stops can be salvaged and reused on the cut chain.



PR.312
Figure 12-15.–Installation of a slide fastener. Step 2.



TURN EDGES UNDER AND SEW

PR.313
Figure 12-16.–Installation of a slide fastener. Step 3.

HOOK AND PILE TAPE FASTENERS

Hook and pile tape is a fastener constructed of woven nylon material. The assembly consists of two sections of tape, one composed of hooks and the other of pile loops. The hook tape contains a multitude of miniature nylon filaments woven in the form of raised loops which can be heat set to retain their shape and cut near their outer edges in order to form a hook engaging section.

The pile tape of the fastener contains a myriad of tiny, soft loops, woven of nylon threads, suitably napped to form a uniform disorientated pile surface of uncut loops capable of being engaged by the hooks of the hook tape component. (See fig. 12-17.)

A closure of the hook and pile tape can be completed by mating the two tapes and applying a slight pressure which forces the hooks into the loops of the pile causing the tapes to adhere to each other. The fastener can be opened easily by peeling apart the two tapes.

A hook and pile tape fastener, when properly engaged, forms a versatile, adjustable, and secure closure. It has the ability to distribute equal stress over an entire surface area.

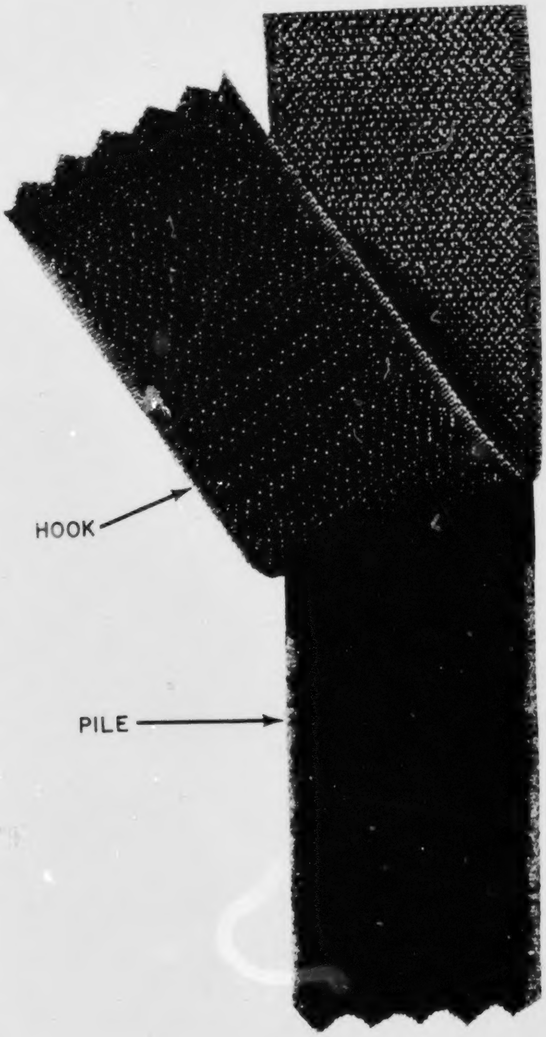


Figure 12-17.—Hook and pile tape fastener.

INSTALLATION

The installation of hook and pile tape will vary with the type job. It can be applied to other materials or fabrics by using approved cements or by stitching.

In the application of hook and pile tape fasteners, always refer to the applicable directives concerning type of thread, stitches per inch, width, and type of tape required.

Types

Hook and pile tape is available in the following two types:

Type I—0.0065 inch monofilament diameter.
Type II—0.0080 inch monofilament diameter.

Widths

The range of widths of hook and pile tape is as follows:

Five-eighths inch.
Three-fourths inch.
1 inch.
2 inch.

Procurement

Hook and pile tapes may be requisitioned through normal supply channels. The hook and pile tapes are packaged separately and may be ordered individually.

CHAPTER 13

HELMETS AND OXYGEN MASKS

PROTECTIVE HELMETS

The wearing of protective helmets during takeoff, flight, and landing by aircrewmen is required in designated types of aircraft.

APH-6 series helmets are configured according to their application. APH-6C helmets (dual visors) are used by pilots and aircrewmen engaged in nuclear weapons delivery missions. The dual visor configuration consists of a clear visor and a gold-coated visor that is used for protection against flashblindness hazard.

The APH-6D helmet (single visor) shown in figure 13-1 is designated as the primary flight helmet for use in all aircraft except helicopters. The single visor configuration consists of one clear or neutral visor.

The APH-6D helmet provides eye protection, sound attenuation and protection for the wearer's head during in-flight buffeting, seat ejection, bailout or crash landings. It is designed to distribute impact forces over the entire helmet, and to absorb these forces so that a minimum amount of impact reaches the wearer's head.

The helmet consists of an outer shell assembly, clear or neutral visor assembly, as required, and a sonic earcup assembly. It is supplied in medium and large sizes. Normally, the helmet is not procured as a complete assembly, previously purchased components may be combined and/or modified to the APH-6C configuration.

The outer shell assembly is molded from fiberglass and polyester resin and provides impact and penetration protection. The edgeroll is made of rubber and provides protection from the helmet edges. The outer shell assembly also includes the inner foam liner, sizing liners, communications cord set, oxygen mask retaining tracks, nape strap, and adjustable chin strap.

The inner foam liner consists of three sections and are made of cellular polystyrene sheets molded to fit the inside contour of the outer shell. The liner is provided to absorb and dissipate impact forces.

The sizing liners permit fitting the helmet to the aircrewman's head contour to provide maximum protection, stability, and comfort.

The sizing liners are leather covered and supplied in three configurations: back, crown, and front. Each liner is available in either a thick, thin or extra thin sizes.

The communications cord set connects the aircraft communications system to the helmet earphones. A boom type microphone, not provided with the helmet, is available for use on the S-2, T-28, and T-34 type aircraft.

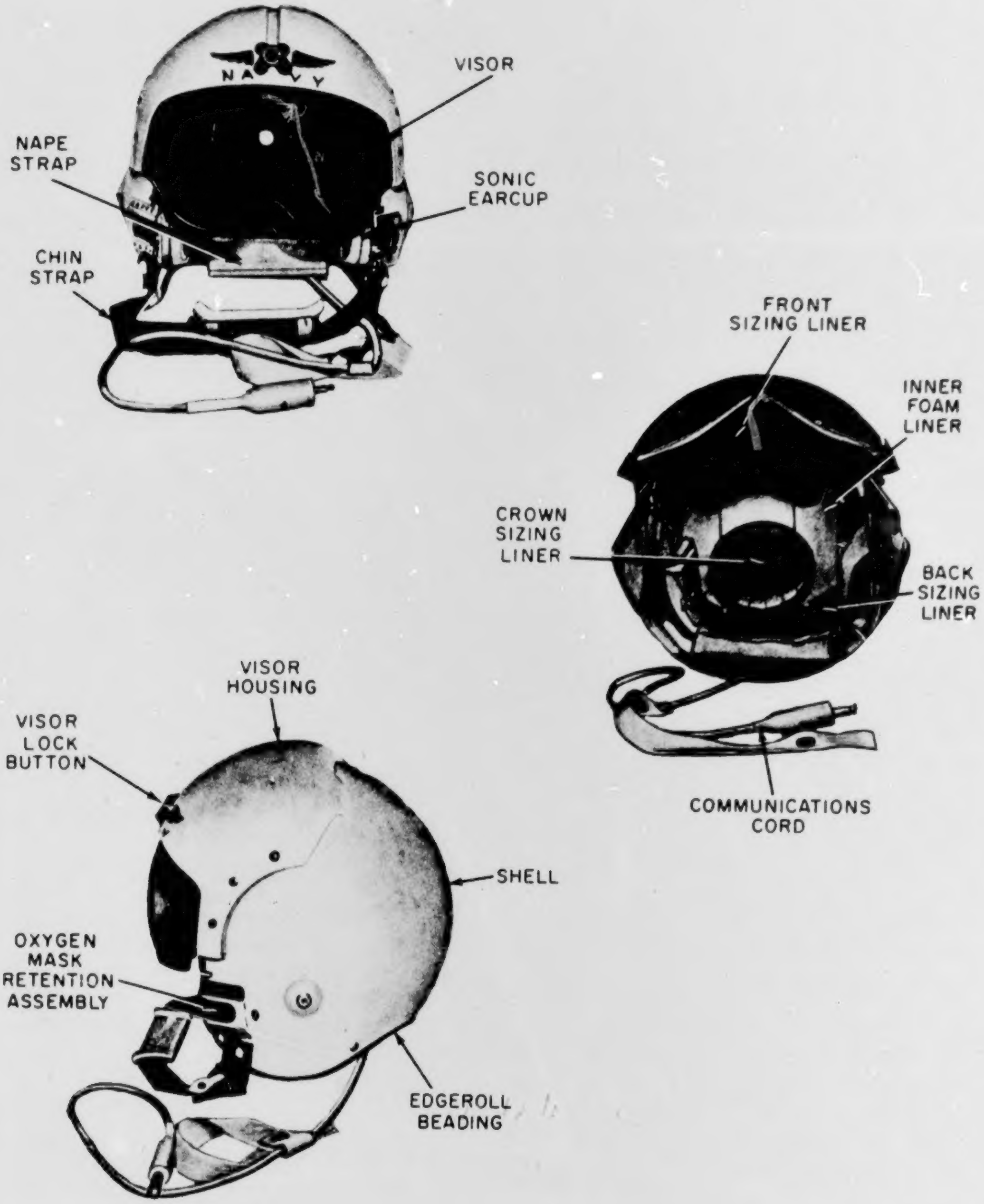
The boom microphone installation is allowable on the right or left side of the helmet unless aircraft design limits the position.

The oxygen mask suspension system attaches to a retaining track attached to each side of the helmet and the mask can be easily attached and disconnected at the retaining track.

A nape strap and chin strap are available; they are made of 1-inch nylon webbing and covered with a soft cloth material to provide comfort and reduce skin chafing. The nape and chin strap are provided to increase helmet retention.

The visor assembly provides protection from sun glare, dust, windblast, foreign particles, and flash fires. The visor is protected by a molded fiberglass housing when not in use. Two visors, clear and neutral, are provided for use. The percentage of light transmittance of the neutral visor is 12 to 18 percent. The percentage of light transmittance of the clear visor is 90 percent or greater.

Each sonic earcup consists of an earphone housing and a foam rubber ear cushion. The earphones attach to two sets of wires leading from the communication cord junction block. The sonic earcup assembly provides sound


VISOR
NAPE STRAP
SONIC EARCUP
CHIN STRAP
FRONT SIZING LINER
INNER FOAM LINER
CROWN SIZING LINER
BACK SIZING LINER
COMMUNICATIONS CORD
VISOR HOUSING
VISOR LOCK BUTTON
SHELL
OXYGEN MASK RETENTION ASSEMBLY
EDGEROLL BEADING

PR.315

Figure 13-1.—APH-6D protective helmet.

attenuation from the ambient noise sources and thereby improves radio reception.

Fitting

The APH-6D protective helmet must be individually fitted to the aircrewman. To provide maximum protection, comfort and sound attenuation, a good fitting must consist of a snug fit at the cheeks, forehead, and nape of the neck. Loose fitting helmets are more apt to produce pressure areas and discomfort. Fittings which result in abnormal pressure and discomfort after a short wear period must be corrected.

To properly fit the APH-6D helmet to the aircrewman, he must select the helmet size by trial fit. With sizing liners inserted, the aircrewman shall don the helmet by placing both thumbs on the inside of the earcups, and pulling the helmet sides outwards; inserting the forehead into the helmet between the thumbs and rolling the helmet backward until it is satisfactorily positioned on the head. The earcups should be centered on the ears. If they are not centered, reposition the earcups by loosening the securing screws and adjusting the earcups.

If this adjustment is not sufficient use different sizing liners, and/or add or delete the earcup spacers. If the fit is uncomfortable to the aircrewman, remove the helmet and insert different sizing liners. If the helmet is still uncomfortable, don a different size helmet. When changing from a medium to a large size helmet, use thin sizing pads in affected areas and large liners in unaffected areas. When the proper size liners are determined, remove the protective paper from the backs of the liners and press them into the helmet. Aline the bottom edge of the back and front sizing liners with the bottom edge of the inner foam liner.

Adjust the nape strap for a snug comfortable fit. It may be necessary to position the locking screw in the second grommet. In extreme cases, a replacement nape strap may be fabricated to provide a snug fit. The nape strap pad is positioned in the center of the nape strap and stitched in two places.

When relieving uncomfortable pressure points in a helmet, it is possible that stability may be sacrificed for comfort.

To insure proper stability after adjustment and fitting, the aircrewman should don the helmet, snugly tighten the chin strap and shake his head vigorously. If the helmet moves independently of the head, thicker sizing liners must be inserted in either the front, back, or crown area to obtain proper stability, maximum protection, comfort and sound attenuation.

An excessive gap between the nose and visor when the visor is in the extreme down position can be corrected by substituting a thin or extra-thin crown liner.

Increased upward vision can be obtained by using a thick crown liner. Upward visual angle should be approximately 45 degrees.

Maintenance Procedures

Minimal maintenance, which is cleaning the visor and outer shell, can be performed by the aircrewman as needed. All other maintenance operations must be performed upon issue and at least every 91 days thereafter by the lowest level of maintenance possible.

Inspect the sizing liners and inner foam liner for looseness. Loose liners should be recemented and worn or torn sizing liners replaced. Inspect all helmet hardware for damage and security of attachment.

Tighten or replace the hardware as necessary. Inspect the shell assembly for cracks, dents, scratches, splits, or delaminations that are visible or discernible to the touch. Split, cracked, or delaminated helmets should be disassembled and the damaged parts discarded. Remaining undamaged helmet parts can be retained for refurbishing or repair of other helmets.

Chin and nape straps, communication cord set, earphones, and the dual visor assembly should be inspected for damage and replaced as necessary. Inspect sonic earcup grommets for presence, snug fit, cuts, and other damage.

Visors may be cleaned using mild soap and water, they should be dried with a clean, soft cloth. If the visors are still soiled or scratched, clean with an approved polish for use on acrylic plastic. To preserve the plastic surface, use polishing wax for the final application. Do not use solvent or abrasive type cleaners on visors.

Refurbishing Helmets

When refurbishing a helmet the chemical stripping agents must only be used in a well ventilated area. Do not inhale fumes, and keep away from sparks or open flames. Use extreme care with the application of Methyl Ethyl Ketone. Excessive or repeated use may damage the fiberglass.

Do not use sanders or abrasives unless absolutely necessary since they can reduce helmet thickness. Depending on the condition of the helmet, strip from it the parts that need repairing or replacing.

Remove all reflective tape, insignia, decals and other markings which have been applied to the painted surface of the helmet. Reflective tape should be carefully removed using a knife edge. Stubborn tape and damaged surface paint may be removed by a limited application of Methyl Ethyl Ketone. Day-Glo or Hi-Viz colors must be completely removed as any trace of these colors will bleed through the final finish. A limited application of xylene or toluene may be used to remove sunbonded Day-Glo and Type B Filter-ray coatings. Lacquer may be removed by applying lacquer thinner.

Minor scratches, gouges and unused screw or rivet holes which require patching must be filled with a uniform mixture of equal parts by volume of epoxy resin and hardener.

Allow epoxy to cure at least four hours. When cured, sand to remove excess material and to provide a smooth flush finish.

Prepare the helmet outer shell assembly for finishing by shielding the interior surfaces, fittings, webbing, and other hardware to prevent contamination. Use masking tape when necessary. Clean the outer shell assembly with a damp cloth to remove foreign materials.

Apply one coat of primer paint and allow to dry. Best results are achieved by spraying the primer and white paint. The paint finish should be completely smooth to the touch. The primer and white paint should be thinned and allowed to dry in accordance with the applicable coating specification. Apply one coat of insignia white paint .012 to .015 inches thick.

Allow the paint to dry and clean the entire helmet by sponging with an approved detergent. Remove any excess detergent by sponging the helmet with clean water and allow the helmet to air dry. Mix the detergent in accordance with the instructions printed on the container. If instructions are not available on the container, use a 2 percent aqueous solution.

Reinstall the removed parts and replace all defective or damaged parts. Apply an identification decal to the lower, outside, rear, center edge of the helmet.

Addition of Reflective Tape

The addition of reflective tape on the helmet provides for improved detectability of the downed aircrewman. The tape must be affixed to all helmets. However, in combat areas the tape may be removed, as the Commander directs. White and red reflective tape is recommended, as they afford the greatest detectability. When applying the tape, the pattern to be used shall be at the discretion of the Unit Commander, as long as the tape pattern covers a minimum of 80 percent of the helmet visor housing and outer shell.

For more detailed information concerning the APH-6D helmet refer to, Aircrew Personal Protective Equipment Manual, NavAir 13-1-6.7.

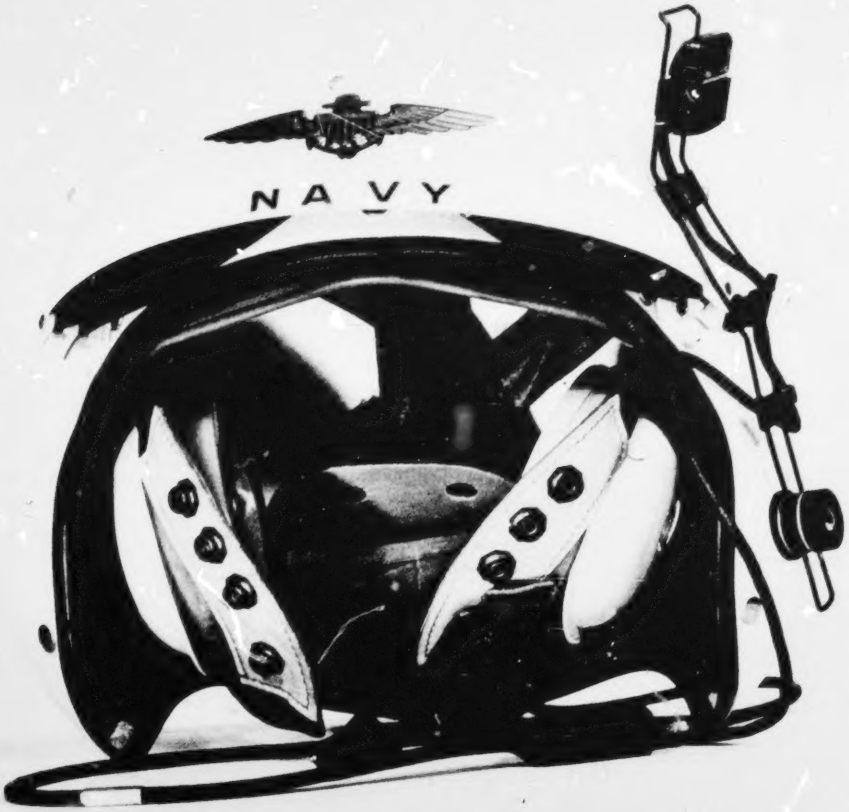
TYPE SPH-3B

The SPH-3B helmet shown in figure 13-2 is designated for use by all helicopter aircrewmen.

The SPH-3B helmet provides protection for the wearer's head during in-flight buffeting or crash landings. It is designed to distribute impact forces over the entire head, and to absorb these forces so that a minimum amount of impact reaches the wearer's head. The SPH-3B helmet is supplied in two sizes, regular and extra large. The helmet consists of an outer shell assembly, an inner foam liner, sizing liner, inner cloth liner assembly, dual integrated visor, communication cord set, and a microphone adapter.

The outer shell assembly is molded from fiberglass and polyester resin and provides for impact and penetration protection. An edgeroll, made of neoprene foam, provides protection from the helmet edges.

The inner foam liner is made of cellular polystyrene sheets molded to fit the inside contour of the outer shell. The liner is provided to absorb and dissipate impact forces.



PR.319

Figure 13-2.–SPH-3B protective helmet.

The sizing liner, which is optional, aids in fitting the helmet to the aircrewman's head contour by padding the helmet at the nape of the neck.

Sizing liners are provided in 1/4, 1/2, 5/8, and 3/4-inch sizes.

The inner cloth liner assembly includes the sonic earcup assemblies and foam pads for sizing and comfort; it also has adjustable crown and nape straps.

The dual integrated visor provides protection from sunglare, dust, windblast, foreign particles, and flash fires. The visors are protected by a molded fiberglass housing when not in use. Two visors, clear and neutral, are provided for use. The percentage of visible light transmittance of the neutral visor is 12 to 18 percent. The percentage of light transmittance of the clear visor is 90 percent or greater.

The communications cord set connects the aircraft communications system to the helmet earphones. The microphone adapter, located on the helmet is provided to allow for attachment of a boom type microphone.

Fitting

The SPH-3B protective helmet must be individually fitted to the aircrewman. To provide maximum protection, comfort and sound attenuation, a good fit shall consist of a snug fit at the cheeks, forehead, and nape of the neck. A loose fitting helmet is more apt to produce pressure areas and discomfort.

To fit the helmet the aircrewman must select the size by trial fit. Don the helmet by placing the thumbs on the inside of the earcups and pulling the helmet outward; inserting the forehead into the helmet between the thumbs and rolling the helmet backward until satisfactorily positioned on the head. The three crown straps may be adjusted to allow the head to set as far into the helmet as possible without interfering with vision or touching the inner foam liner All three crown straps must have the same tension when the crown pad is pressed in the center.

The earcup tension strap and chin strap should be adjusted in conjunction with the spacer and sizing liner to obtain proper stability, maximum protection, comfort and sound attenuation. Use one thickness sizing liner as required and mate the hook and pile tape firmly. Spacers are secured to the back of the earcup assemblies. If necessary, tighten the nape strap, with the helmet on, by pulling on the free end. To loosen, raise the protrusion on the buckle and pull the secured end of the strap. Tighten the nape strap to provide a snug fit with the chin strap fastened.

To insure a proper helmet fit and stability after making adjustments, don the helmet, snugly tighten the nape and chin straps, and shake the head vigorously.

If the helmet moves independently of the head, readjust the sizing liners, spacers, and adjusting straps. If necessary, file and sand the nose indentation to fit the contour of the aircrewman's nose. Insure that the visor at the nose indentation is free of nicks and roughness.

Maintenance Procedures

Minimal maintenance, which is cleaning the visor and outer shell, can be performed by the aircrewman as needed. All other maintenance operations must be performed upon issue and at least every 91 days thereafter by qualified personnel at the lowest level of maintenance possible.

Inspect the sizing liners and inner foam liner for looseness, recement where applicable and replace worn or torn sizing liners. Inspect the shell assembly for cracks, dents, scratches, splits, and delaminations. Inspect all hardware for damage and security of attachment, tighten or replace hardware as necessary. Inspect straps, communications cord set, earphones, and dual visor assembly for damage. Replace parts as necessary.

Visor cleaning may be accomplished using a mild soap and water and drying with a soft, clean cloth. For removal of minor scratches or remaining soiled areas, use acrylic plastic polish. To preserve the visor's plastic surface, use polishing wax for the final application. Do not use solvent or abrasive type cleaners.

Refurbishing the SPH-3B protective helmet is accomplished by using the same procedures as described for the APH-6D helmet. For more detailed information concerning the SPH-3B helmet refer to the Aircrew Personal Protective Equipment Manual, NavAir 13-1-6.7.

OXYGEN MASKS

Oxygen masks are the final link in conveying oxygen from the aircraft system to the user. A satisfactory regulator and oxygen system or a full cylinder of oxygen is of little value to a pilot if his oxygen mask is not operating properly in every respect.

Oxygen masks are pilots' personal equipment; that is; after initial fitting, they are retained by the individual to whom issued. Fitting, adjustments, maintenance, cleaning, and incorporating modifications are the responsibility of the PR.

The important factor to remember about identifying any oxygen mask is its compatibility with the oxygen system with which the mask is to be mated.

Three types of oxygen masks are discussed in this chapter. They are the PRESSURE BREATHING MASK, the DEMAND OXYGEN MASK, and the SMOKE and FULL FACE OXYGEN MASK.

A-13A PRESSURE BREATHING MASK

The pressure breathing mask used in the Navy is designated as the A-13A. This oxygen mask is used with composite diluter demand systems, with straight diluter demand systems (with no emergency valve), with automatic positive pressure diluter demand regulators, or with the miniature positive pressure 100 percent demand mask or chest mounted regulator.

The A-13A oxygen masks currently used are satisfactory for flights up to 50,000 feet altitude without regard to service life if properly maintained. The incorporation of the laminate seal (described later) improves fitting and comfort of the mask to the face.

Construction

The A-13A pressure breathing oxygen mask consists of a facepiece, inhalation valves, pressure compensating exhalation valve, microphone cavity, harness assembly, and breathing hose assembly. It has two cheek flaps that protect about half the face.

The A-13A mask is supplied in sizes small, medium, and large. The mask should be selected to fit the facial features of the user.

With the exception of the retention assembly, suspension straps, and laminated face seal, the A-13A mask is molded from Buna-N rubber stock, medium green in color. This stock is compounded to resist mildew and remain flexible at a low temperature.

The A-13A silicone pressure breathing mask is constructed of elastomer materials, has a dark olive color, and is made in three sizes. The A-13A silicone mask has a longer shelf life, contains ozone resistant properties, is free of odor, and causes less facial irritation.

The inner parts and mask components are the same as all A-13A oxygen masks. The laminar seal may not need to be installed.

Operation

When a flow of oxygen under pressure is supplied to the mask, the pilot must exhale at a pressure greater than that of the oxygen intake, in order to open the pressure compensated exhalation valve and complete the breathing cycle. Figure 13-3 illustrates the operation of the A-13A mask with the diluter demand system; figure 13-4 illustrates the operation of the mask with the pressure breathing system.

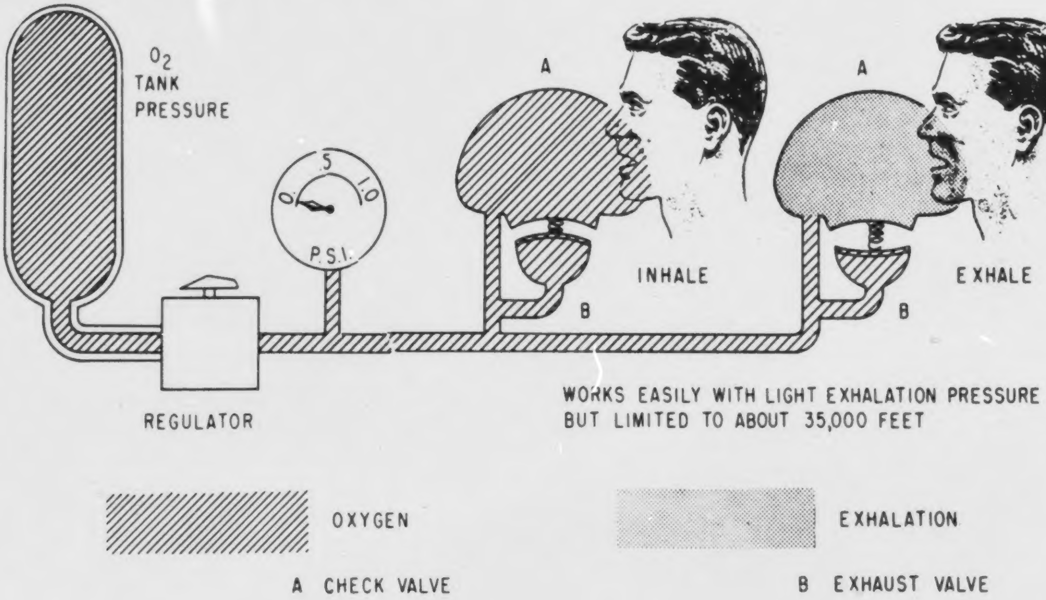
The inhalation value assembly is composed of a plastic valve seat, silicone flapper, silicone valve gasket, and plastic cover. The oxygen passes through an inlet hose attached to the inlet port of the mask. The oxygen is then fed through the inlet port to the interior of the mask through two inlet ducts, one on each side of the mask. The inhalation check valves prevent the exhaled air from passing back through the inhalation ducts of the facepiece. A plastic cover eliminates the collection of moisture around the valve where it may freeze under extremely cold conditions and directs the flow of incoming oxygen within the mask.

The pressure compensating exhalation valve (fig. 13-5) fits into the exhalation valve cavity of the mask and the valve stem extends through an opening in the wall that separates the exhalation port housing and the inlet tube. This arrangement permits the open end of the valve stem to be exposed to the oxygen as it passes from the inlet port into the facepiece. The stem of the exhalation valve brings oxygen pressure to bear against the lower side of the compensating diaphragm (15). This pressure, plus the pressure of a calibrated spring, causes the diaphragm to close the valve. In this position, no oxygen can escape from the facepiece.

As the pressure in the facepiece is increased against the main diaphragm (10), because of exhalation of the wearer, the combined pressure in the inlet port and the calibrated spring is overcome, and the valve opens. Exhaled air (9) escapes from the exhalation port at the bottom of the facepiece. The valve is constructed so that a pressure of only 1 millimeter of mercury greater than that of which is being supplied by the regulator will force it open.

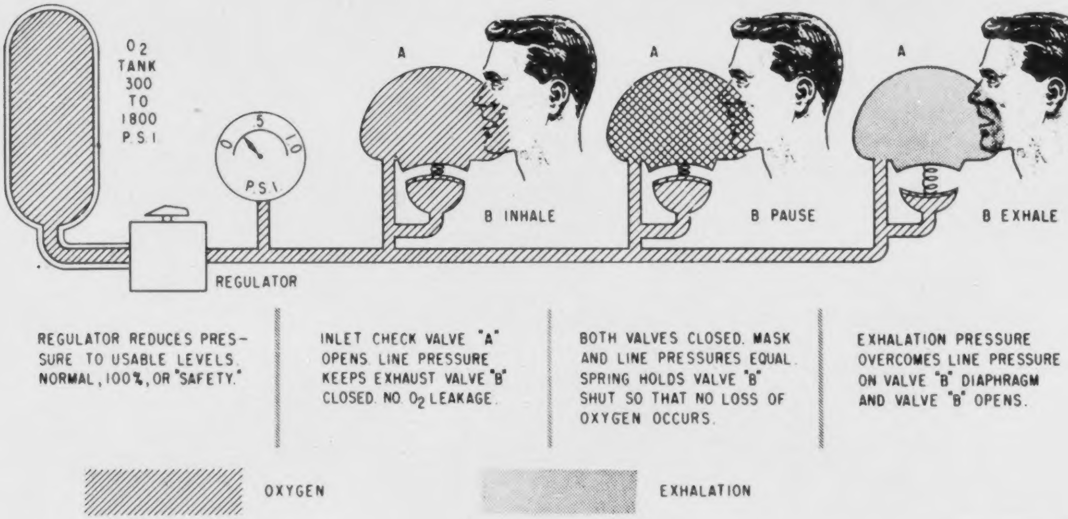
Microphone Installation

The ANB-M-C1 microphone used with the oxygen mask is drawn from supply by the pilot at the time he draws his oxygen mask and other personal flight gear. The original installation of the microphone is the responsibility of the PR. The repair of any reported malfunctions and


O2
TANK
PRESSURE
.5
0
1.0
P.S.I.
A
A
INHALE
EXHALE
B
B
REGULATOR
WORKS EASILY WITH LIGHT EXHALATION PRESSURE
BUT LIMITED TO ABOUT 35,000 FEET
OXYGEN
EXHALATION
A CHECK VALVE
B EXHAUST VALVE

PR.321

Figure 13-3.—Operation of the A-13A oxygen mask with the diluter demand system.


O2
TANK
300
TO
1800
P.S.I.
.5
0
1.0
P.S.I.
A
A
A
B INHALE
B PAUSE
B EXHALE
REGULATOR
OXYGEN
EXHALATION

REGULATOR REDUCES PRESSURE TO USABLE LEVELS. NORMAL, 100%, OR "SAFETY."

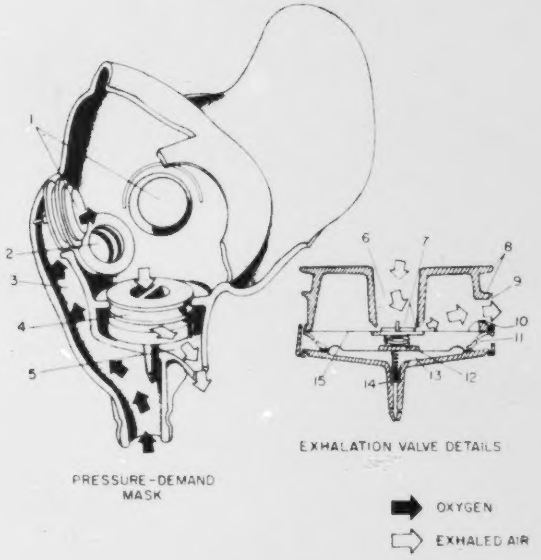
INLET CHECK VALVE "A" OPENS. LINE PRESSURE KEEPS EXHAUST VALVE "B" CLOSED. NO O_2 LEAKAGE.

BOTH VALVES CLOSED. MASK AND LINE PRESSURES EQUAL. SPRING HOLDS VALVE "B" SHUT SO THAT NO LOSS OF OXYGEN OCCURS.

EXHALATION PRESSURE OVERCOMES LINE PRESSURE ON VALVE "B" DIAPHRAGM AND VALVE "B" OPENS.

PR.322

Figure 13-4.—Operation of the A-13A oxygen mask with the pressure breathing system.



PR.323

1. **Inhalation valves.**
2. **Microphone cavity.**
3. **Inlet port to mask.**
4. **Pressure compensated exhalation value.**
5. **Outlet for exhaled air.**
6. **Exhaled air enters exhalation valve here.**
7. **Plates which stiffen the main diaphragm.**
8. **Projections on valve housing which seat in mask.**
9. **Exhaled air leaves the valve here.**
10. **Main diaphragm.**
11. **This port permits pressure between the two diaphragms to equalize with the outside atmosphere.**
12. **Cup which holds hairspring in place between the two diaphragms.**
13. **Oxygen supply pressure is exerted in this compensating chamber.**
14. **Exhalation valve stem.**
15. **Compensating diaphragm.**

Figure 13-5.–Cutaway of pressure-demand mask and exhalation valve details.

modifications is the responsibility of the avionics division and is to be performed by electronics technicians.

Before installing the microphone, disassemble the mask and clean the facepiece and corrugated hose in a solution of mild soap, Specification MIL-C-18687 and warm water.

Remove all traces of any white granular substance which may be present in new masks. If not removed, an excessive amount of these tiny granules can become trapped under the rubber flaps of the inhalation valves thereby preventing a perfect seat. The inhalation valves and their rubber valve flaps must be perfectly seated to prevent an equalizing back pressure into the mask tube. Such a condition will prevent use of the exhalation valve.

Before installing the exhalation valve, clean it, removing dirt and dust particles that lie between the diaphragms and their contacting seats. Particles of dirt trapped under the diaphragm can prevent the exhalation valve from closing off, thereby permitting outside air to be drawn in, diluting the oxygen. Dry and reassemble the mask with the exception of the inhalation valves. Leaving the inhalation valves out of the facepiece until after the microphone is installed makes it easier to install.

The steps required for the installation of the ANB-M-C1 microphone are as follows:

1. Remove the microphone cord "hold plug" by pulling it out at the front of the mask. Lubricate cord with soap solution.
2. Pass the microphone cable through the rubber guide at the front of the mask.
3. Insert tapered long nose pliers through mike cord hole from the inside of the mask; tips of the pliers must show at least 1/8 inch beyond the outside edge of the hole.
4. With the pliers opened slightly, just enough to permit a sure grip on the outer diameter of the cord, insert the end of the microphone cable through the elongated hole. Handle the pliers carefully in order to avoid tearing the hole and the rubber bridge piece joining the inner mask lips.
5. Once the outer diameter of the microphone cable has been grasped by the pliers, do not loosen the grip until the cable has been drawn through the hole. Loosening the grip while drawing the cable through the hole usually results in a second unseen grip on the frail terminal wires with subsequent damage to the cables and/or terminal ends. Pull enough cable up into the mask to gain an adequate length for connecting the terminals to the microphone.
6. Remove the microphone from its plastic adapter by unscrewing. This plastic case and

case cover are of no further use as they are not inserted into the microphone cavity of the oxygen mask. Remove the three connections from the back side of the microphone.

7. Attach the wire terminals to the microphone with the lockwashers beneath the terminals.

8. After the terminals have been connected, draw the mike down to its cavity in the forward position of the oxygen mask. Do not pull the cord abruptly, and stop the pulling action when the mike is flush with the rim of the cavity.

9. Using a blunt instrument (such as a pencil eraser), work the mike into its cavity slowly and progressively. CAUTION: Do not press on plastic portion of mike, press on metal edge. When a part of the mike has been entered into its seat, pull out more of the surplus cable. When doing this, be careful not to break the terminal connections. Completely seat the mike in its cavity.

10. Being exceptionally careful, pull out all the remaining surplus cable and remove the slack between the guide and where it emerges from the hole.

11. Replace the inhalation valves and covers, making certain that the arrow on the covers are pointing downward. If the inside surface of the plastic covers have not been scored, preventing the rubber valves from sticking to them, comply with the latest NavAirSysCom publication referencing the modification. All newly manufactured inhalation valve covers will already be modified, making the field change unnecessary.

12. Place the oxygen mask to your face and check for leakage around the hole where the microphone cable enters the mask. Test the breathing action of the mask on a mockup system, using safety pressure.

13. Have the installed microphone BENCH CHECKED by the avionics division, making certain that it will work properly.

Testing and Inspecting A-13A Mask

PREFLIGHT TESTS.—Preflight tests should be made to establish the security of all parts, with special attention given to the inlet check valves and exhalation valve. The plastic shields must be scored on the inside and be snap seated over the inlet valves.

The inlet valves and exhalation valve must be free from dirt and dust particles. A preflight test should be made just prior to each flight by attaching the mask to the pressure-demand regulator installed in the aircraft. The operational check should be under both demand and pressure-demand conditions. In the event any difficulty is encountered, the oxygen mask should be replaced.

Check the mask for fit and minimum mask leakage in the following manner:

1. Adjust the mask securely in place and connect the mask to the regulator breathing tube.

2. With the oxygen system turned on, place the regulator safety pressure selector lever in the ON position. Induce a severe outboard mask leakage by placing two fingers under the mask sealing surface (cheek flaps) and observe the flow indicator. It should remain in the FLOW position.

3. Reposition the mask on the face and after a few respirations, hold the breath and again observe flow indicator. If there is no mask leakage, the flow indicator will remain in the NO FLOW position. If there is any leakage, the flow indicator will assume the FLOW indication position.

4. Adjust the suspension straps until the leakage is stopped.

5. Return the safety pressure selector lever to the OFF position and continue with flight preparations.

MASK HOSE AND FITTING LEAKAGE TESTING.—Affixing the mask assembly to the face with the helmet in place and, using the mask suspension, adjust the strap for a snug comfortable leaktight fit. Attach the MC-3A connector to the oxygen supply and set regulator on 100% oxygen with supply valve off. Inhale sharply and deeply, and hold the inhalation (keep inhaling) as long as possible. If there is no inboard leakage, you will not be able to inhale.

TESTING VALVE ASSEMBLIES.—With both inhalation valves and the compensated exhalation valve installed in the mask assembly, place a clean smooth rubber stopper (size No. 1), in place of the MC-3A connector and perform the following tests:

1. Inhalation Valve: Holding the mask close to the face, but not completely sealed to the face, inhale deeply and then immediately press the

mask to the face forming a tight seal and forcibly exhale through the exhalation valve. If the inhalation valves are not closing (sealing) properly, the exhalation valve will not open. If the inhalation valves are seating properly, the exhalation will be smooth and with minimum resistance.

2. Exhalation Valve: Place an obstruction (rubberband or equal) under the rubber flapper of one of the inhalation valves in a manner to prevent it from forming a seal. Repeat the testing procedure as described in test No. 1. If the exhalation valve is functioning properly, it will not open when the subject exhales, and exhalation through the valve will not be possible.

Installation of Laminate Seal

This modification must be accomplished on all A-13A oxygen masks, (excepting the silicone type). If a pilot specifically requests the adaptation of the seal on a silicone mask, special silicone cements must be used.

This modification on the A-13A oxygen mask is accomplished as follows:

1. Thoroughly roughen the sealing surface of the facepiece with emery paper or any other suitable abrasive.
2. Apply an even, medium coat of cement to the rough side of the laminate and to the surface of the mask previously roughened. NOTE: The container of cement should be tightly sealed when not in actual use.
3. Determine the approximate centerline of facepiece sealing surface and centerline of laminate.
4. When applied cement feels tacky, lightly lay the upper nose of the laminate and the mask sealing surface in such a manner that the points of the respective centerlines coincide. Care should be exercised so that the rest of the tacky surfaces do not contact each other until symmetrical alinement is obtained.
5. After alinement is assured, lay the laminate and press tightly against the facepiece and allow to dry thoroughly (approximate drying time 24 hours).

NOTE: If laminate is not positioned correctly, or if a wrinkle has developed in laminate, strip laminate from facepiece. Clean facepiece with solvent and repeat, using a new laminate.

Installation of Mask-Mounted Regulators

In today's high performance aircraft, space and weight are vital factors. One method of solving these problems is through the miniaturization of 100 percent demand oxygen regulators.

It is the Aircrew Survival Equipmentman's responsibility to make certain that these regulators and oxygen masks are installed properly.

Miniature oxygen breathing regulators are mask or chest mounted and used both in flight and bailout or emergency condition. The various types of mini regulators are installed on the A-13A oxygen mask as follows:

1. Firewel 1732 and the Bendix regulator may be mask mounted by disconnecting the corrugated mask tubing from the A-13A mask.

Remove the clamp, tubing, and fiber insert from the mask inlet port.

Connect the oxygen hose to the oxygen inlet port of the regulator, inserting the outlet of the regulator into the mask inlet port. Clamp the regulator to the mask with the hose clamp and replace microphone wire.

2. Firewel 2700 and the Robertshaw-Fulton regulators, mask mounting.

Disconnect the corrugated mask tubing from the A-13A mask, removing the clamp and tubing. Remove the fiber insert from the mask inlet port and connect the oxygen inlet port of the regulator. Install the small end of the elastometer on the regulator pickup tube.

Move the regulator toward the oxygen inlet of the mask and connect the large open end of the elastometer to the exhalation valve pickup tube, making certain these two parts mate.

Position the regulator into the mask inlet, and replace the clamp and microphone wire.

3. Firewel 2700-15M, Robertshaw 226-20004 and 226-20004-3 mini regulator chest mounting.

Loosen the Tinnerman clamp and remove the MC-3A fitting. Thread the locknut (TRU-SEAL) to the redar hose. The Teflon face of the locknut should face the end of the male threaded fitting.

Insert the regulator into the mask hose and tighten the clamp. Insert the redar hose into the regulator.

4. Bendix Regulator 29211C1 and 29211B1 may be mounted by loosening the Tinnerman clamp and removing the MC-3A fitting.

Thread the locknut (TRU-SEAL) to the redar hose. The Teflon face of the locknut should face the end of the male threaded fitting. Screw the right angle elbow into the regulator, positioning the female portion of the elbow so that it is alined with the axis of the regulator.

Insert the regulator into the mask hose, tighten the clamp, and insert the redar hose into the regulator.

After installing any of the above mentioned regulators, the PR must check and test each unit for proper security and operation before issuing them to flight personnel.

Safety precautions to be observed when working with oxygen masks and regulators are as follows:

1. Handle all miniature regulators with care.
2. Never connect the regulator to an inlet source greater than 90 psi.
3. Clean regulators with only the approved cleaning solvents or solutions.
4. Remove miniature regulators from masks and bench test every 60 days.

DEMAND OXYGEN MASKS

The A-14A oxygen mask should be used with a demand system not having safety pressure features. It is designed to supply adequate oxygen even during bodily exercise in extreme cold in altitudes up to 37,500 feet. With added precautions adequate oxygen is supplied to 40,000 feet if the mask is correctly fitted.

The A-14A mask assembly consists of a mask body which completely covers the nose and mouth. It is fitted with a rubber exhalation valve of the flutter type. The adjustable straps of the suspension harness are arranged differently in comparison with the pressure type mask. The corrugated mask tube is equipped at the opposite end with a single male connector fitting. Regular snap fasteners (not the three-way snap type) are provided for attachment of the mask harness of the helmet.

The microphone is installed in a cavity similar to that in the pressure mask. Since it was not designed to hold pressure, there are no inhalation valves installed in the open ports of the A-14A mask. The exhalation valve is very simple in construction and is designed to prevent air from entering the mask upon inhalation. This means that the rubber flapper is located on the OUTSIDE of the valve.

A rubber cover, or protector, for the inhalation ports is secured to the inside of the facepiece. It is designed to prevent moisture from entering the ports and/or to prevent the formation of ice in the same vicinity.

There are no inner lips in the A-14A. Upon exhalation, the exhaled air will flow out through a flutter type exhalation valve seated in the bottom of the mask, then through two ports which are vented to the atmosphere. One of these ports is larger than the other. The larger one allows inspection of the outer portion of the flutter valve and seating of the valve proper.

The exterior microphone cable duct on the A-14A mask is different from the cable duct on the pressure type. In order to insert the cable in the cavity, the tip of the projecting smooth molded cable duct must be cut off. In doing this, care must be taken not to cut off too much of the tip. Removing an excessive amount of duct will result in a hole too large in diameter to adequately seal itself around the cable.

The A-14A mask is available in four sizes—large, medium, small, and extra small. Maintenance of the A-14A is similar to that given for the A-13A in the preceding section.

Smoke and Full Face Oxygen Mask

This mask is replacing the A-14A oxygen mask in some types of aircraft. The operating principles of the mask are the same as the A-14A. The main difference is that the smoke mask has a full facepiece that completely covers the face. Maintenance of the smoke and full face oxygen mask is similar to that given for the A-14A and A-13A.

CLEANING OF OXYGEN MASKS

Cleaning of oxygen masks must be accomplished as often as service conditions require but not less than once every 2 months. The A-13A (silicone) cleaning must not be less than once every 3 months. After disassembling all removable components, throughly inspect each part for serviceable condition. Use the cleaning compound, aircraft surface, MIL-C-18687.

With the proper mixture of 1 1/4 ounces of liquid compound to 1 gallon of warm potable water, wash the mask facepiece using a clean soft gauze pad or brush. After all surfaces have been wiped or brushed, submerge the entire mask in the cleaning solution and agitate throughly.

NOTE: Do not use alcohol in any form to clean the mask; do not use any flammable solvents or toxicant liquids for cleaning.

Using the approved cleaning solution, wash all mask parts and components with a soft gauze pad or brush. The microphone and MC-3A connector must be cleaned with a damp gauze pad only.

Rinse all parts, after washing with the cleaning solvent, in clean, cold water. Cold water tends to form beads and is easily shaken off. Dry the mask and accessories, selecting a well-ventilated place.

Do not hang the mask in sunlight, and do not use compressed air or oxygen to blow masks dry. The ideal storage temperature is 70° Fahrenheit.

After the mask and all components have dried, assemble the complete oxygen mask and thoroughly test the unit for serviceability.

Sanitizing (Disinfecting)

Oxygen masks that are not on a personal issue must be sanitized after each use, using the solutions discussed in the following paragraphs.

Use 1/4 pint of thimersoal as issued; this is a 1.1000 solution of clear merthiolate and distilled water. Add 25 drops of 10 percent concentration of benzalkonium chloride (MIL-B-36021) to 1 quart of potable water.

Moisten a gauze pad with the solution, squeeze to prevent dripping, and wipe out the interior of the mask exclusive of valves and the microphone.

Wipe the valves and microphone with a clean dry cloth. Place the cleaned, RFI oxygen mask in a bag for reissue.

Safety Precautions

Observe the following safety precautions when working with oxygen masks:

1. Never use a screwdriver on any mask part except the hose clamp.
2. Always use the proper cleaning compound MIL-C-18687 and potable water.
3. Never use oil or grease around oxygen masks.

CHAPTER 14

AIRCREW PERSONAL PROTECTIVE EQUIPMENT

Aircrew personal protective equipment plays an important role in the safety and survival of Navy and Marine Corps pilots and aircrewmen. It protects them from the elements and provides the comfort necessary for efficient performance. Its primary function is to protect aircrewmen from the multienvironmental hazards they are likely to encounter. Because no single item of clothing or equipment could encompass all of the necessary characteristics, the present inventory includes both general flight gear (designed to provide overall protection and comfort in both cold and hot climates) and more specialized protective assemblies for cold water exposure, anti-g, and high altitude survival.

Naval aircrew protective equipment has been designed to meet the extreme stresses of a combat environment and to provide fire protection, camouflage, and other escape and evasion design features.

Due to the wide range of environmental conditions in which aircraft must operate, a compromise between comfort and the necessary level of protection has, in some cases, been necessary.

Post-crash and emergency cold water exposure are two critical areas where the operational requirements will, of necessity, take some precedence over optimum cockpit flying conditions. Emphasis is given to the development of materials and clothing assemblies that will improve survival chances and specifically minimize injuries and prevent the loss of life in case of aircraft accidents in a hostile environment.

The items of safety and survival equipment specified in this chapter are the recommended minimum requirements. Deviations from these requirements, necessitated by such considerations as aircraft configuration, type and duration of mission, area of operation, proximity of hostile forces, and availability of SAR facilities, are specified by the NATOPS Flight Manual for the individual model aircraft and authorized by the local commander.

The latest available flight safety and survival equipment, as authorized by the Aircrew Personal Protective Equipment Manual, NavAir 13-1-6.7, is used by aircrewmen and passengers for flight in naval aircraft.

At the time of writing this publication, there are numerous personnel, representing all types of aircraft communities, and a special committee involved in updating the entire survival equipment program. A variety of factors has to be considered when new concepts are being evaluated. Among them are mission profile, flight duration, crew station configuration, comfort, SAR availability, egress capability, type clothing worn, technological advances, safety, maintenance, and probable access to auxiliary survival equipment. Since personal survival equipment and procedures for its use are continually being evaluated, careful attention to NavAir 13-1-6.7 and the NATOPS manual is recommended.

This chapter is not designed to introduce all of the available articles of flight clothing and protective equipment, but offers instructions on fitting and adjusting those items which need special attention in their initial servicing. The protective helmet must be equipped for stability and be made adaptable to the oxygen mask.

In the initial fitting of clothes, the decisions revolve around the correct choice of fit, which is that of selecting the proper size. However, everyone's measurements do not conform with standard size requirements. In naval aviation, it is the PR's job to make flight and protective clothing fit as nearly perfectly as possible.

Occasionally, pilots and aircrewmen request that additional pockets or slings be incorporated in their flight clothing. However, the practice of arbitrarily attaching a sheath knife to the trouser leg of a flight suit might later endanger a smooth and uninterrupted egression by allowing the suspension lines of the opening parachute to foul on the sheath or possibly hamper mobility during egress.

Whatever the requests for modifying flight clothing might be, the only allowable deviation from the authorized configurations is based on NATOPS, and is not at the discretion of the aircrewman.

FLIGHT CLOTHING

Flight clothing and certain related items are generally issued on a personal basis to designated aircrewmen. Additional allowances of flight clothing are maintained to provide issuance to other personnel on a temporary basis as required.

In either case, the PR must discharge his responsibilities concerning those items and quantities of flight operational protective equipment considered necessary to maintain his activity in a continual condition of operational readiness.

COVERALLS

Flying coveralls are supplied in several types and configurations. This chapter will cover the summer, intermediate, anti-g, and anti-exposure assemblies. Flying coveralls may be worn singularly or in combination with other coveralls and protective equipment, as appropriate.

Summer Flying

The summer flying coverall is designed to be worn as an outer garment in warm temperature zones and to provide fire protection in the event of an aircraft fire. It is a one-piece garment fabricated of synthetic polyamide (Nomex) cloth. It is light in weight, will not support combustion, and does not melt or drip. The coverall will begin to char at 700 to 800 degrees F. The fabric has good abrasion resistance and is nonabsorbent. Cotton underwear should be worn under the coverall for optimum comfort. The summer flying coverall is supplied in 14 sizes from 36 short to 48 regular. Incorporated into the coverall are nine pockets, an adjustable waist band, and closures for the neck, wrist, and ankles. These closures are designed to resist windblast, leeches, and insects. The coverall is olive green in color with black slide fasteners to help prevent detection in a combat area.

The summer flying coverall is designated for use by all aircrewmen and is fitted to the individual in a size that normally corresponds to his civilian suit size. Sleeves of the coverall should always be worn down and closed at the wrist to assure maximum fire protection. The summer flying coverall may be worn over or under the anti-g coverall.

Intermediate Flying Coverall, CWU-1/P

The intermediate flying coverall is designed to be worn on over-land flights as an outer garment in intermediate temperature conditions. The CWU-1/P is a one-piece, lined coverall. The outer shell is nylon twill, and the lining is rayon faced with wool backing. The coverall has a belted drop seat, a concealed hood in the collar, a full length slide fastening front closure, two breast pockets, two side pockets, two thigh pockets, a knife pocket on the left leg, two leg pockets, and a sleeve pocket on the left sleeve. The coverall also has adjustable sleeve cuffs and leg opening slide fasteners to insure a snug fit. Pass-through openings are provided on each side.

The intermediate flying coverall is available in 12 sizes ranging from small short to extra large long. Cotton underwear should be worn under the coverall for optimum comfort.

NOTE: The intermediate flying coverall provides sufficient fire protection so that it may be used in place of the summer flying coverall. The openings behind the shin pocket may be sewn closed if not used.

When authorized by the local Commander, the CWU-1/P coverall is issued to individual aircrewmen. The intermediate flying coverall is fitted to the aircrewman and normally corresponds to his civilian suit size.

The intermediate flying coverall is used with standard Navy personnel protective equipment and may be worn over or under the anti-g coverall. Sleeves should be down and closed at the wrists for maximum fire protection.

MK-2A Cutaway Anti-G Coverall

Although there is no limit to the speed a human can endure in straight and level flight in an aircraft, changing speed or direction can lead to reactive forces of inertia to which the body has a sharply limited tolerance. In the case of extreme stresses exerted by forces of the type met in seat ejection, ditching, or parachute opening shock, the short duration of the force restricts its effects. However, changing the direction of flight often produces prolonged radial acceleration (longer than a second) which can have dangerous effects.

At 5 g's the pilot's body is exposed to a force of inertia which increases its "weight" and that of its components five times. This increased "weight" has many effects. The pilot is pushed down into his seat. His arms and legs feel like lead and manipulation of the controls becomes more difficult. In addition, the extra weight of the viscera (internal organs) causes abdominal and chest discomfort. Most important, however, is the effect on the circulatory system.

At 5 g's the pressure exerted by the column of blood between the head and the heart becomes just about equal to the blood pressure in the arteries. As a result, the pressure supplied by the heart is not great enough to pump an adequate supply of blood to the head.

To counteract these effects, the pressure in the arteries must be increased above the heart level. At the same time, distended vessels and tissue and fluid spaces in the regions below the heart must be restored to normal. This is accomplished by the anti-g coverall.

With the anti-g system, compressed air is metered to the coverall in proportion to the gravitational force being exerted. The bladders of the coverall inflate compressing the legs and abdomen of the wearer by an amount also proportional to the gravitational force. Thus, the coverall prevents venous pooling in the abdomen and lower extremities and forces blood from the lower to the upper part of the body. This effect increases venous return to the heart and increases resistance to the shifting of blood to the lower limbs. In addition, it causes the diaphragm to be raised, decreasing the distance between the heart and the eyes and/or the brain. Altogether, it increases the tolerance of the pilot an average of about 2 g's.

Without an anti-g coverall, the average pilot can withstand 4.5 to 5.5 g's without losing vision or blacking out. With a coverall, he is capable of withstanding 6.0 to 7.0 g's. However, this protection is available only for sustained accelerations of 4 to 5 seconds or longer in maneuvers other than snap maneuvers.

Anti-g equipment does not offer protection in snap maneuvers where 10 to 12 g's can be applied in approximately 1 second. Such brief forces are not as harmful to the body as lesser forces which are sustained for a number of seconds.

The MK-2A anti-g coverall is designed to provide protection against blacking out, loss of vision, and lowered mental efficiency due to high g-forces experienced in high performance aircraft. The coverall consists of a bladder and outer shell. The bladder is constructed of polychloroprene coated nylon cloth and covers the abdomen, thighs, and calves. The bladder is equipped with an air inlet port which attaches to the aircraft anti-g system by means of a flexible hose. The coverall outer shell is constructed of nylon cloth and houses the bladder. The coverall is cut away at the buttocks, groin, and knees for ease of movement and comfort. The outer shell is equipped with waist and leg entrance slide fasteners, six adjustment lacings, and two leg pockets with slide fastener closures.

The anti-g coverall is available in four sizes. Anti-g overalls are fitted and adjusted to the crewman on a best-fit basis. With a proper fit, the lace adjustments should be tightened approximately halfway, and the cutout should expose the knees, groin, and buttocks without binding or hindering movement. The coverall should fit snugly with the bladder deflated, especially at the waist. With a proper coverall fit, the inflated bladder should compress the waist, thighs, and calves firmly and evenly.

ANTI-G HOSE.–The anti-g hose must be fitted and assembled after the correct overall size is determined. To fit and assemble the anti-g hose, proceed as follows:

1. Don the coverall, sit in the aircraft, and determine the desired length of anti-g hose.
2. Cut the 6-foot length of flexible hose to the desired length in accordance with steps 3 through 7.

3. Using a razor blade or a sharp knife, cut through the hose between the reinforcing wire and the convolutions.

4. Using wire cutters, cut the reinforcing wire.

5. Pull approximately one-half turn of the reinforcing wire away from the flexible hose and cut close to the hose. If necessary, deburr the cut end of the wire and press the wire back into the hose.

6. If necessary, trim the end of the hose even, and remove any hose particles or other foreign matter from the inside of the hose.

7. Using a hot soldering iron, lightly sear the frayed end of the hose covering stockinette.

8. Slip a clamp over each end of the flexible hose.

9. Using water or a silicone paste, lubricate the insert portion of the nozzle assembly and quick-disconnect hose connector.

NOTE: Do not use oil, grease, or a similar organic contaminate as a lubricant.

10. Insert the nozzle assembly into one end of the hose.

NOTE: If undue difficulty is experienced in inserting the nozzle into the hose, perform step 11.

11. Machine the raised bead on the insert portion of the nozzle assembly to 0.662-inch diameter. Treat the machined surface with Alodine 12 or an equivalent film.

12. Insert the quick-disconnect hose connector in the other end of the hose.

13. Insure that the fittings are properly inserted in the hose, position the clamps between the raised beads and the body of the fittings, and tighten the clamps. Insure that the clamps are tightened sufficiently by grasping the hose and sharply jerking on the fittings.

14. Cover each clamp with three layers of 3/4-inch wide pressure sensitive electrical tape.

15. If required, attach an adapter ring to the anti-g hose nozzle end and mate the ring and nozzle end of the hose to the coverall air inlet port.

NOTE: The adapter ring is not required when the coverall is worn under the MK-5A anti-exposure suit as the fitting on the MK-5A serves the same purpose as the adapter ring.

A special type hose is used in the RA-5C and F-4 aircraft application.

The MK-2A cutaway anti-g coverall will remain in service until it fails the leakage test.

Quick Donning Anti-Exposure Coverall QD-1

The quick donning anti-exposure coverall QD-1 is designed to provide protection for an aircrewman in cold weather conditions, particularly in the water. The coverall is normally used in conjunction with the winter flying suit or the intermediate flying coveralls (CWU-1/P). The QD-1 is not worn continuously, but is stowed onboard the aircraft for emergency use.

The QD-1 is available in one size only. Waterproof, insulated mittens and an inflatable hood are used with the basic coverall. The QD-1 coverall is constructed of nylon life preserver cloth coated with a chloroprene rubber compound, making the cloth waterproof.

Donning the coverall is accomplished through an opening in the front of the shell which extends from the crotch up to the left shoulder.

This opening is sealed by a waterproof slide fastener. The leg portions of the coverall are terminated by boots constructed of the same material as the shell with an outer covering of nylon duck cloth. Wrist seals and a neck seal are permanently attached to the coverall. A pocket is located on the upper front portion of each leg. Ankle and waist straps are provided to prevent the suit from sagging and hindering movement during escape.

Two quick donning anti-exposure mittens are provided; they are constructed of chloroprene coated nylon life preserver cloth on both the inner and outer surfaces with a urethane-foam insulation layer. An elastic band and strap are provided for fitting each mitten, and a retention line prevents the loss of the mittens. The mittens are stored in the pockets until needed.

An anti-exposure coverall hood is also stored in one of the pockets. During a survival situation, the hood is donned in place of the helmet and it provides insulation by the use of a layer of air.

The hood is inflated through an oral inflation valve located on the left side of the hood.

When authorized by the cognizant Type Commander, the QD-1 is carried onboard larger patrol, cargo, and similar type aircraft. In general, the aircraft should carry the QD-1 when the combined temperature of the air and water is below 120 degrees F.

To don the QD-1 coverall in case of an emergency, proceed as follows:

NOTE: The QD-1 is worn over clothing but under the parachute harness, survival vest, and life preserver.

1. Remove the parachute harness, survival vest, and life preserver.
2. Remove the QD-1 from its container and unroll it.
3. Spread the coverall out in front and place the feet down through the leg opening and into the boots.
4. Pull the coverall up over the shoulders and insert the arms into the sleeves.
5. Grasp the neck seal in both hands, spread the seal apart, and pull it over the head.

Insure that the fabric of undergarments is not trapped under the neck or wrist seals as this would allow water to enter the coverall.

6. Close the entrance slide fastener making sure that the fastener is fully closed to properly seal the coverall.
7. Remove any trapped or excess air by stretching the neck seal away from the neck and squatting for a moment. Release the neck seal before standing.
8. Adjust the waist and leg straps.
9. Don the life preserver, survival vest, and parachute harness.

Upon entering the water, the QD-1 coverall provides at least temporary buoyancy; however, every attempt should be made to inflate the preserver and enter a raft as soon as possible. The waterproof coverall fabric and wrist and neck seals prevent the water from wetting the clothing worn under the coverall. This preserves the insulating properties of the clothing, greatly extending the time an aircrewman may survive in adverse conditions.

Immediately after entering the raft, the mittens and hood should be donned. To don the hood, the survivor must remove all other headgear. After securing the snap fasteners, the hood is inflated through the oral inflation valve until a snug fit is achieved. As necessary, the hood may be topped off with the inflation valve.

In-service coveralls will remain in service until they are beyond economic repair; repair is not normally performed on a QD-1 coverall beyond 5 years from the date of manufacture.

Ventilated Anti-Exposure Flying Coverall CWU-33/P

The ventilated anti-exposure flying coverall assembly, CWU-33/P, is part of an exposure protective assembly designed for continuous wear and for the protection of the wearer from exposure to cold water, wind, and spray as a result of an emergency egress from an aircraft at sea. The assembly incorporates a ventilation system which should be used in conjunction with a conditioned or ambient air source.

The CWU-33/P anti-exposure coverall is available in 18 sizes.

A size which closely approximates the wearer's civilian suit size should be chosen first. Then a final size should be chosen by trial and error until the closest fit with the least amount of discomfort and restriction is attained. A properly fitted coverall should not show excessive material around the arms and legs. The front torso should fit taut and the back should show excess material across the shoulder blades and waist area. The taut front prevents the material from bunching in the waist area and presents the coverall from riding up when seated, which could cause neck chafing. Excess material is allowed across the shoulder blades to allow for sufficient outward and upward arm movement. Small size adjustments can be made to allow for particular body sizes that require an in-between size.

To obtain the required protection from the coverall, the innershell must be worn with the outershell; polyvinyl chloride underwear, heavy wool socks, inflatable hood, and anti-exposure mittens must also be worn. Insure that the slide fasteners are fully closed on water entry.

The CWU-33/P coverall assembly innerliner is constructed of 1/8-inch thick polychloroprene cellular rubber.

The outershell is fabricated from high temperature resistant Nomex.

Donning of the CWU-33/P coverall is accomplished through the entrance slide fastener opening in front of the assembly which extends from the crotch to the collar.

To don the CWU-33/P coverall, proceed as follows:

1. Don the polyvinyl underwear.
2. Don a pair of heavy wool socks.
3. Don the anti-g coverall if one is to be worn under the CWU-33/P.
4. Open the entrance, sleeve, and leg slide fasteners fully.
5. With the innershell attached to the outershell; insert the legs into the coverall and work the feet and lower legs down into the assembly.
6. Don the boots.
7. Insert one arm at a time into the coverall and work the coverall over each shoulder in turn.
8. Attach an anti-g fitting on the anti-g coverall to the anti-g fitting on the CWU-33/P if the coverall is worn underneath the assembly.
9. Close the entrance, sleeve, and leg slide fasteners.
10. Engage the ventilation and, if applicable, anti-g hoses. If the anti-g coverall is not worn, close the inlet with a cover plate. Insure that the mittens and hood are present, and stowed in the pockets located on the legs or in the anti-g coverall pockets if the anti-g coverall is worn over the CWU-33/P coverall assembly.

To maintain comfort, the coverall is equipped with a ventilation system. When aboard the aircraft, the aircrewman connects the ventilation and, if applicable, the anti-g hoses to the aircraft supply system. Air is introduced through a vent fitting on the left side of the coverall and flows into a manifold and ducting system to provide ventilation for the arms, legs, and crotch. Air flows back over the body, around and through the spacer panels which hold the coverall slightly away from the body, and exits at the neck.

In the event of an emergency aircraft egress, the fittings on the hoses disconnect from the aircraft sources.

Checks are provided to prevent water from entering the coverall through the ventilation or anti-g connections. To use the anti-exposure hood, the survivor must remove all other head gear and don the hood. After securing the snap fasteners, the hood is inflated through the oral inflation valve until a snug fit is achieved. As necessary, the hood may be topped off with the oral inflation valve.

The CWU-33/P coverall may remain in storage for 3 years from the date of manufacture. After that time it must be inspected annually. This process will continue until the coverall is placed in service or is beyond economic repair. In-service coveralls will remain in service until beyond economic repair. Repair is not normally performed on CWU-33/P coveralls beyond 5 years from the date of manufacture.

Ventilated Wet Suit CWU-9 Anti-Exposure Coverall

The wet suit anti-exposure coverall is designed to provide protection for an aircrewman in cold weather conditions, particularly in the water. The suit is ventilated and is used in conjunction with the summer flying coverall. Anti-g coveralls may be worn under or over the wet suit.

The wet suit will prevent permanent physical injury provided the following conditions exist:

NOTE: Rescue time is equal to or less than 1 1/2 hours.

1. Water temperature is equal to or greater than 32 degrees F.
2. Air temperature is equal to or greater than 20 degrees F.
3. Wind velocity equal to or less than 20 mph.
4. Inflatable hood, mittens, extreme cold weather underwear, wool socks, and boots are worn.
5. All slide fasteners are closed on water entry.

The complete wet suit coverall assembly consists of the following equipment items:

1. Anti-exposure coverall hood.
2. Anti-exposure mittens.
3. Rhovyl Clevyl T underwear.
4. Flying boots.
5. Summer flying coverall.
6. Heavy wool socks.

The summer flying overall is worn to provide protection for the foam wet suit material and to provide additional fire protection and stowage space for the mittens, hood, and other equipment. The wet suit has provisions for wearing the anti-g coverall under the wet suit. However, if desired, a larger size anti-g coverall may be worn over the wet suit providing it does not interfere with accessibility of the hood, mittens, and other equipment in an emergency.

The wet suit coverall is constructed of polychloroprene foam. Insulation is provided by the small air pockets or cells formed by the foam. The foam material is lined with a stretch nylon fabric which increases its strength, facilitates donning and doffing, and provides increased comfort to the wearer.

The wet suit coverall is loose fitting, and is constructed to be more comfortable while in a seated position. The neck opening is lowered to prevent chafing; the front of the coverall is shorter than the back to prevent bunching at the waist; and the legs are bent at the knees to prevent binding.

The foam material is a good insulator and is air and water impermeable. It will retain body heat and moisture in cold, hot, or normally comfortable environments. To maintain comfort, the coverall is equipped with a ventilation system. Air introduced through a vent fitting on the left side of the coverall in the chest area bleeds into a manifold and ducting system to provide ventilation for the arms, legs, and crotch. Air flows back over the body, around and through spacer panels which hold the coverall slightly away from the body, and exits at the neck.

The wet suit coverall is worn as an alternate to the MK-5A anti-exposure suit when authorized by the cognizant Type Commander.

To don the wet suit coverall, proceed as follows:

1. Don underwear.
2. Don a pair of heavy wool socks.
3. If applicable, don anti-g coveralls.
4. Insert the legs into the wet suit coverall and work the feet and lower legs into the assembly.
5. Don the boots.
6. Insert the arms into the wet suit and work the suit up over the shoulders.
7. If applicable, attach the anti-g fittings on the anti-g coverall to the anti-g fittings on the wet suit coverall.
8. Close the front, leg, and arm slide fasteners.
9. Don the summer flying coverall.
10. Engage the ventilation hose and, if applicable, route the anti-g hose through the cutout in the summer flying coverall. If the anti-g coverall is not worn, close the anti-g fitting on the wet suit coverall with a cover plate. Insure that the hood and mittens are present. If they are not to be worn immediately, they should be stowed in the summer flying coverall pockets easily available for emergency use.

FLYING JACKET TYPE G-1

The man's intermediate flying jacket is designed to be worn as an outer garment. It is constructed of leather with a nylon cloth lining. The collar is mouton, and the cuffs and waistband are made of stretch knit cloth to provide a snug fit. The flying jacket is equipped with two external pockets and one inner pocket. Bellows, which extend from the shoulders to the waist, prevent the jacket from riding up or binding with arm movement. The flying jacket is available in seven sizes, ranging from 36 to 48.

The flying jacket is designed to provide protection in intermediate temperatures and it is used with standard Navy personal protective equipment; additionally, it may be worn under the parachute harness. Sizes of the flying jacket, when fitted to the aircrewman, normally correspond to his regular jacket size.

WINTER FLYING HOOD

The winter flying hood is designed to provide protection for an aircrewman's head, neck, and upper body in adverse, low-temperature conditions.

The head portion of the flying hood is constructed of cotton cloth with an alpaca pile cloth lining. The front edge of the head portion is faced with mouton for comfort, and a hinged storm flap trimmed with wolverine or wolf fur ruff is provided for protection. The body portion of the garment is constructed of cotton cloth. The hood is equipped with a slide fastener front closure, a drawstring for adjustment of the head portion, and snap fastener closures for the armholes. This allows for quick removal of the hood.

The flying hood is designated for use with the winter flying suit coverall during overland flights in certain geographic areas.

To don the winter flying hood, proceed as follows:

NOTE: The winter flying hood must be donned before donning the winter flying suit jacket.

1. Open the front closure slide fastener and place flying hood on the head.
2. Fasten the armhole snap fasteners and insure that the protective inner flap is positioned between the slide fastener and the body.
3. Close the front closure slide fastener.
4. Tighten the drawstring until the head portion of the flying hood fits snugly, and secure the drawstring with a bow knot.
5. The storm flap can be buttoned back or around the face, depending on weather conditions.

FLYING BOOT

The impact resistant flying boot is designed to protect the wearer's foot against high impact forces. The boot is water resistant.

The upper boot is constructed of high quality calfskin or cattlehide; is black in color; and is lined with soft, full grain cattlehide glove leather. The boot is 8 inches high when fully laced and is available in sizes from 5 narrow to 15 extra wide. The traction tread outsoles and heels are made of nonslip, nonmarking, jet-fuel-resistant rubber.

The steel box toe is constructed of cold rolled carbon steel to provide a safety margin through greater compression resistance. The flying boot is designated for use by all aircrewmen and is fitted to the individual in a size normally corresponding to his shoe size.

FLYING GLOVE

The fire resistant glove is designated for use in warm to moderate temperature zones and provides protection in the event of fire. The gloves are snug fitting and designed to provide maximum dexterity and sense of touch so as not to interfere with the operation of the aircraft and use of survival equipment. The glove is available in sizes 7 through 11. Since the fabric is stretchable, this range of sizes will accommodate any hand. The flying gloves are constructed of soft cabretta gray leather (palm and front portion of the fingers) and a stretchable, green, light weight polyamide Nomex fabric (entire back of hand).

The cloth portion of the glove does not melt or drip and will not support combustion. The fabric will begin to char at 700 to 800 degrees F. The leather portion of the glove provides a nonslip surface (even when wet) for manual operations. The fire resistant flying glove is fitted to the aircrewman and normally corresponds to his glove size. It must fit snugly on the hand.

SMALL ARMS PROTECTIVE BODY ARMOR

The small arms protective body armor is designed to be worn as protective equipment over the outer garment to provide helicopter aircrewmen with small arms fire, fragmentation, and penetration protection. Body armor is available in two types; Type I includes the carrier and front armor plate insert, and Type II includes the carrier and front and rear armor inserts.

The small arms protective body armor carrier is constructed of nylon cloth and is equipped with fragmentation protective nylon felt shoulder pads, hook and pile tape closure at the shoulders and waist, a quick-release strap, and a small pocket on the front of the carrier.

Armor inserts are constructed of boron carbide, aluminum oxide, or silicon carbide. The armor inserts have a covering of ballistic nylon (spall shield) and rubber edging to prevent damage to the insert edges. The LPP-1 life preserver (modified) is the only life preserver authorized for use with the body armor.

The carrier and inserts are available in short, regular, or long sizes. Type I body armor weighs 13 pounds and Type II body armor weighs 23 pounds. The body armor is designated for use by helicopter pilots and aircrewmen in combat areas as directed by the Air Group Commander.

NOTE: Pilots and copilots require only front protection as aircraft seats are armored on the bottom, back, and sides.

The body armor must be worn tight. Any restraint belts worn with the armor should be tight. The small arms protective body armor is fitted to the aircrewman on a best-fit basis, with the insert or inserts installed.

Properly fitted armor should extend from the waist to the collar bone. The shoulder hook and pile tape closure may be used to raise or lower the armor carrier for maximum upper chest protection and comfort.

REQUISITIONING

Requisitioning of aircrew personal protective equipment is a function of the supply officer. Naval and Marine Corps student pilot personnel, naval aviators, naval flight officers (including navigators, controllers, and radar operators), and flight surgeons in a flight status are eligible to receive any or all allowed items of personal protective equipment, not to exceed one complete outfit. Items of safety and survival equipment listed below are the recommended minimum requirements. Deviations from these requirements necessitated by such considerations as aircraft configuration, type and duration of mission, area of operations, proximity of hostile forces, and availability of SAR facilities will be specified by the NATOPS Flight Manual for individual model aircraft.

The latest available aircrew personal protective equipment, as authorized by Aviation Crew Systems Manual, Volume 7 (Aircrew Personal Protective Equipment), NavAir 13-1-6.7, should be used by crewmen and passengers for flight in naval aircraft.

Requirements for Crewmen

NOTE: Items marked by an asterisk (*) may be omitted by crewmen when flying in cargo/transport class aircraft, and U-11, providing such flights do not involve carrier operations.

*1. Protective helmet.
*2. Flying boots.
*3. Flying gloves.
*4. Flying coverall.
5. Identification tags.
*6. Survival knife and sheath; not to be worn exposed or attached to the life preserver.
*7. Personal survival kit; appropriate to the area of operations.
*8. Signal device; required for all night flights and flights over water or sparsely populated areas. An approved pistol with tracer ammunition or pencil flare gun meets this requirement.
*9. Flashlight; required for all night flights.

Requirements for Passengers

The requirements for aircrew personal protective equipment as listed above for crewmen are waived for passengers flying in cargo/transport class aircraft and helicopters. The same applies to multipiloted fixed wing aircraft other than transport when such aircraft are not performing an operational mission and are outside of combat zones.

For all other aircraft, passengers must be equipped with the same items of protective equipment as crewmen.

The above articles of equipment are carried by the supply officer or delegated to an officer in charge of a flight clothing pool. Issues are made directly to the individual concerned and the supply officer or his representative makes an entry in the appropriate columns of the "Flight Clothing Record" of the Aviators Flight Log Book, OpNav Form 3760-31.

When the person is relieved of duty involving flying, he must turn in to the supply officer any flight clothing in his possession. If an article of flight clothing becomes unserviceable for any reason such as damage, wear, or other deterioration, it may be turned in to the supply officer or the flight clothing pool and exchanged for a serviceable item.

If any item is lost or missing for any reason, the person charged with custody of the item is required to furnish a Survey Request Report and Expenditure (NavSup Form 154) for the missing item.

Winter flight clothing and flight clothing for nonpilot crewmen are the responsibility of the parachute loft and must be maintained in accordance with the allowances listed in the Section H Allowance List.

Requisitioning of these items is usually made by the senior PR or by another PR designated to handle stores for the aviation equipment division.

Defense Department Form DD 1348 is used by aviation activities both ashore and afloat to requisition material. It is available in card form for mechanized supply activities and in 2-, 4-, and 6-part, interleaved sets for nonmechanized use. Local requirements determine the number of copies to be prepared at nonmechanized activities. Each item of material must be requisitioned on a separate form.

RECORDS AND REPORTS

Records are important for proper accountability of aircrew personal protective equipment, as well as other materials which are assigned to the parachute loft for reissue on a subcustody basis.

The Aircrew Personal Protective Equipment History Card shown in figures 14-1 and 14-2 is designed to maintain vital information on each aircrewman's personal protective equipment.

The card is divided into three sections: Section I is designated for recording all aircrew personal protective equipment either assigned to or used by the aircrewman; Section II is designated for recording compliance with the quarterly inspection program; and Section III is designated for recording all modifications, repairs, or adjustments made to equipment. Inspection dates, modifications, and repairs to each item of equipment must be entered on the card as a permanent record. To aid in integration into a new unit, it may be desirable to have a copy of the history card accompany a transferred aircrewman. When completed, the old card should be attached to a new card. The card is designed to be folded in half and stored in standard 5- by 8-inch index files with the aircrewman's name exposed at the bottom.

These records are subject to inspection at any time by higher authority and should be kept accurate and up to date at all times.

FLIGHT CLOTHING MAINTENANCE AND REPAIR

Part of the PR job is maintaining pilot's and aircrewmen's flight clothing in a serviceable condition. This requires a good basic knowledge of the principles involved in tailoring. PR's are not expected to construct a suit of clothing from a bolt of material, but are expected to be able to make repairs and alterations to most of the available flight clothing.

What are the basic principles involved in tailoring? The first and major requirement is knowing how to sew by machine as well as by hand. Second, knowledge of the materials used and the construction of the garment in need of repairs is necessary in order for the PR to properly analyze the scope of damage and the steps to be taken in making the repair. Third, he must have the ability to apply this knowledge, which can be accomplished only by practice and experience.

There are many shapes, sizes, and types of clothing which may require repairs. It is therefore impossible to learn everything about tailoring from a textbook. The best procedure is to practice at making patches on scrap material as well as replacing a sleeve or collar on an old garment. In this way, one may become proficient at making neat, durable, and proper repairs.

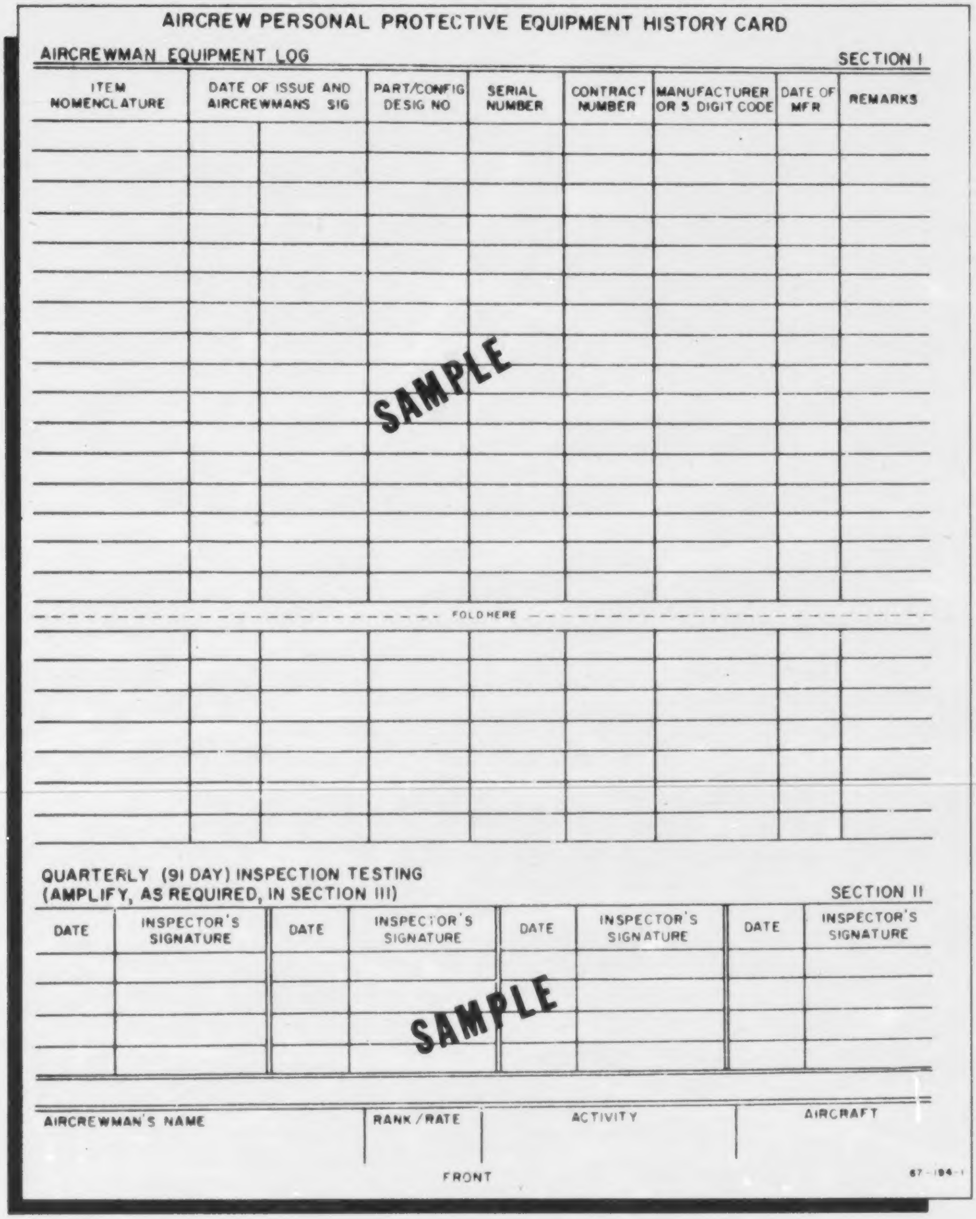
Flight clothing is rarely damaged to the extent that a yoke or piece in the suit has to be replaced. The most common damages are ripped seams and small tears in the material, both of which are easily repaired. Stitching a seam or applying a small patch is no great task; however, the same principles regarding the similarity of materials apply here as well as to the parachute. Always strive to use identical materials regardless of the type of repair.

WARNING: When making an alteration or repair, do not stitch through electrical wiring, rubber bladders, or other similar appendages incorporated in certain types of clothing.

A quarterly inspection program is established at each local level of maintenance. This inspection may conveniently be scheduled to coincide with the 91-day inspection now required for most equipment. This inspection protects against the dangers of flying with unauthorized equipment or configurations, insures that the latest modifications are incorporated, provides a ready evaluation of maintenance, and aids in circumventing compromise of the unit operating efficiency and safety.

SUMMER FLYING COVERALL

The summer flying coverall must be inspected for general condition at intervals not to exceed 91 days. Repairs are limited to mending small tears and holes. Replacement of the slide



AIRCREW PERSONAL PROTECTIVE EQUIPMENT HISTORY CARD

AIRCREWMAN EQUIPMENT LOG

SECTION I

ITEM NOMENCLATURE	DATE OF ISSUE AND AIRCREWMANS SIG		PART/CONFIG DESIG NO	SERIAL NUMBER	CONTRACT NUMBER	MANUFACTURER OR 5 DIGIT CODE	DATE OF MFR	REMARKS

SAMPLE

FOLD HERE

QUARTERLY (91 DAY) INSPECTION TESTING
(AMPLIFY, AS REQUIRED, IN SECTION III)

SECTION II

DATE	INSPECTOR'S SIGNATURE	DATE	INSPECTOR'S SIGNATURE	DATE	INSPECTOR'S SIGNATURE	DATE	INSPECTOR'S SIGNATURE

SAMPLE

AIRCREWMAN'S NAME	RANK/RATE	ACTIVITY	AIRCRAFT

FRONT

67-104-1

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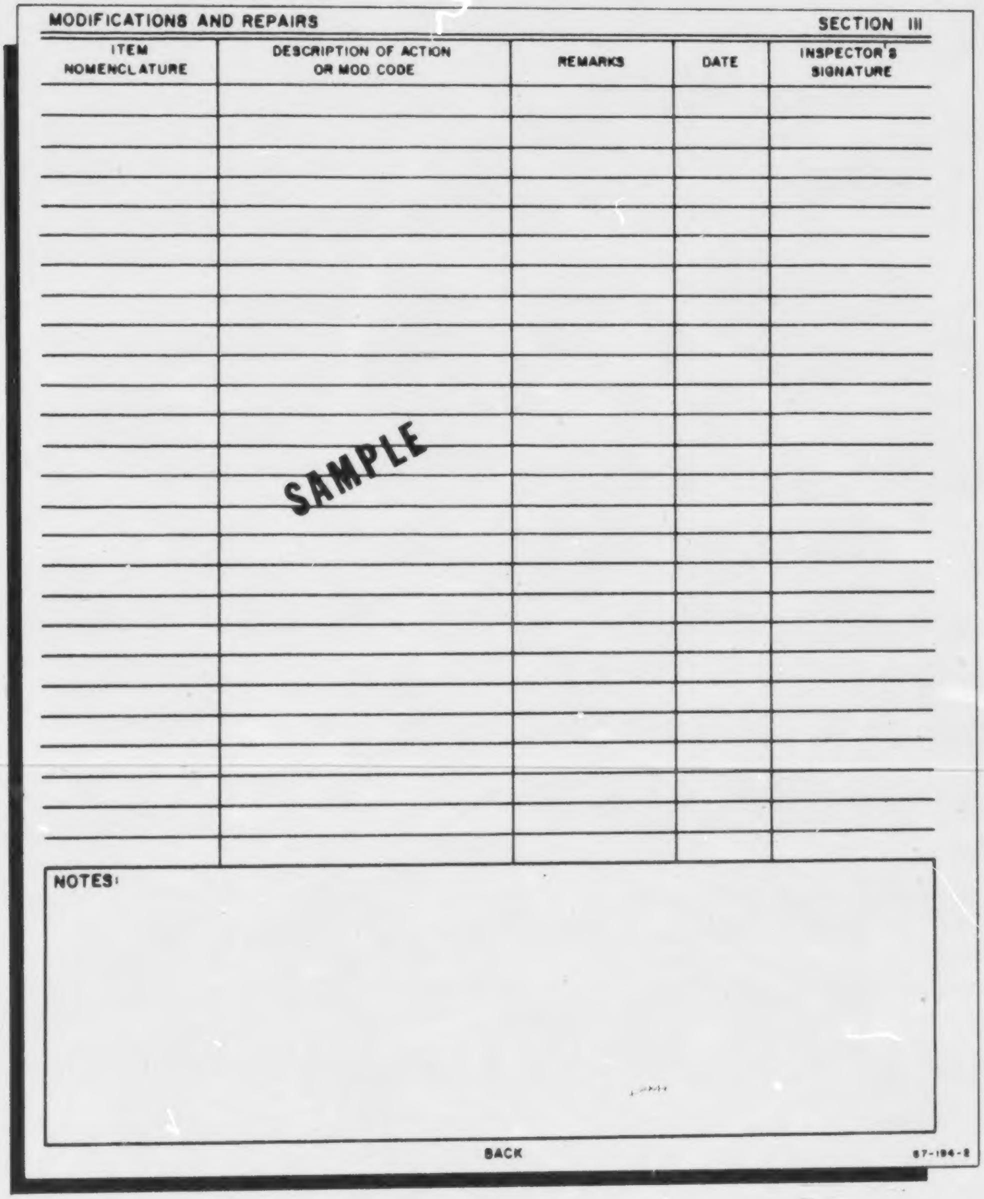
Figure 14-1.—Aircrew personal protective equipment history card, Sections I and II.



MODIFICATIONS AND REPAIRS **SECTION III**

ITEM NOMENCLATURE	DESCRIPTION OF ACTION OR MOD CODE	REMARKS	DATE	INSPECTOR'S SIGNATURE

SAMPLE

NOTES:

BACK

67-194-2

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Figure 14-2.—Aircrew personal protective equipment history card, Section III.

fastener is accomplished at the discretion of the maintenance activities. Only high temperature resistant polyamide cloth and nylon thread may be used for repairs.

Cleaning

The coverall cloth is a drip dry type requiring no special handling and it may be laundered as frequently as needed at home or in a commercial washer and dryer.

Laundering in water up to 140 degrees F and tumble drying up to 180 degrees F will not damage or shrink the coverall. Since the coverall cloth is a high temperature resistant material, ironing will not remove wrinkles and creases. It is recommended that the coverall be hung on a wooden hanger immediately after tumble drying or during drip drying. As laundering will not reduce the flame retardant properties of the cloth, no renewable flame retardant treatment is required. It is recommended that new coveralls be laundered prior to use to soften the cloth and eliminate any possible skin irritation. A commercial fabric softener should be used.

The summer flying coverall should be updated to the current configuration by comparing the configuration of the assembly with the modifications listed in NavAir 13-1-6.7.

INTERMEDIATE FLYING COVERALL

The intermediate flying coverall must be inspected for general condition at intervals not to exceed 91 days.

Repairs are limited to mending small tears and holes. Replacement of the slide fasteners is accomplished at the discretion of the maintenance activities.

Cleaning

Do not hand or machine wash the intermediate flying coverall; it must be dry cleaned only.

MK-2A CUTAWAY ANTI-G COVERALL

Maintenance procedures for the MK-2A cutaway anti-g coverall are as follows:

1. Preflight inspection.
2. Original issue/periodic inspection.
3. Repairs.
4. Cleaning.

Preflight Inspection

The preflight inspection must be performed by the aircrewman prior to each flight. However, the interval between preflight inspections must not exceed two weeks. To inspect the anti-g coverall and hose, examine the following:

1. Slide fasteners for security of attachment, ease of operation, and corrosion.
2. All seams for loose or broken stitches.
3. Nylon outer shell for holes, tears, and abrasions.
4. Air inlet port for bends, dents, nicks, corrosion, and missing or damaged hook and pile tape fasteners.
5. Laces and lace loops for security of attachment and wear.

During the preflight inspection, if any discrepancy is noted, the coverall and hose must be subjected to a periodic inspection.

Original Issue/Periodic Inspection

The original issue/periodic inspection must be performed by the lowest maintenance level possible upon issue and every 91 days thereafter, to coincide with the life preserver calendar inspections. This inspection consists of the inspections outlined for the preflight inspection and, in addition, a leakage test.

To inspect the anti-g coverall hose, remove the 3/4-inch pressure sensitive tape that covers the hose fitting clamps. Inspect the anti-g hose for frayed coverings, cracks, damaged or corroded fittings, and loose or corroded hose fitting clamps.

Inspect the fittings for looseness by grasping the hose and sharply jerking on the fittings. Reinstall three layers of new pressure sensitive tape after the hose inspection.

To perform a leakage test, obtain or fabricate locally a test fixture as outlined in NavAir 13-1-6.7.

Close all test fixture valves and attach the fixture to the air inlet port. The measuring device valve must be closed when the air feed valve is open. Open the air feed valve and inflate the coverall bladder to a pressure of 5 psi. Close the air feed valves and open the measuring device valve. The bladder pressure must not drop more than 1.0 psi in the first 30 seconds. A pressure drop greater than 1.0 psi in the first 30 seconds will constitute a failure. Deflate the coverall bladder and perform the remainder of the required maintenance procedures. Coveralls that fail the leakage test must be replaced.

Repairs

Repairs are performed at the lowest maintenance level possible and they are limited to mending small holes and tears that do not require complete or partial removal of the bladder, replacement of adjustment lace loops, and replacement of leg pockets.

Repair or replacement of the bladder or air inlet port is not authorized. Repairs to the anti-g hose are limited to tightening or replacing the hose fitting clamps.

Cleaning

To clean the MK-2A anti-g coverall, proceed as follows:

1. Seal the air inlet port with a cork or rubber stopper. Do not allow water to enter the bladder. Do not machine wash or dry clean the anti-g coverall.
2. Immerse the coverall in a solution of bacteriostat detergent and hot water. Allow the coverall to soak for 5 minutes. Agitate gently (by hand) for 2 minutes and drain the water. Do not wring the coverall; do not damage the bladder or air inlet port.

NOTE: The detergent must be mixed in accordance with the instructions printed on the container. If instructions are not printed on the detergent container, use a 2 percent aqueous solution.

3. Rinse the coverall in cool, fresh water. Drain the water. Repeat the rinse until all traces of detergent have disappeared from the rinse water. Do not dry the coverall in direct sunlight. Do not use a tumble or spin dryer.
4. Hang the anti-g coverall on a wooden hanger in a dry, well ventilated area.

QUICK DONNING ANTI-EXPOSURE COVERALL QD-1

Maintenance on the QD-1 must be performed at least every aircraft calendar inspection (unless stated otherwise) at the lowest maintenance level possible. Maintenance procedures are grouped as follows:

1. Routine maintenance.
2. Cleaning.
3. Packing.
4. Leakage test.
5. Repairs.
6. Packing for storage.

Routine Maintenance

To perform routine maintenance on the QD-1, examine the following:

1. Cloth surface for cuts, tears, abrasions, and deterioration.
2. Seams for adhesion, stitching, cuts, and tears.
3. Slide fastener for proper operation and sealing.
4. Wrist and neck seals for proper adhesion, wear, and damage.
5. Mittens and hood for damage.

To maintain the slide fastener, do not allow talcum powder to contact it. Lightly coat the rubber coated sides of the fabric with talcum powder. Wipe the slide fastener rubber seal with a soft, clean, lint-free cloth moistened with water. Allow the slide fastener to dry and apply a light coat of silicone lubricant to the seal.

Cleaning

To clean the QD-1 coverall, proceed as follows:

1. Mix a proper strength of a solution consisting of general purpose super concentrate bacteriostat detergent in lukewarm, fresh water.
2. Lay the coverall, inside out, on a table. Sponge the detergent solution onto the cloth.

3. Using a soft bristle brush, clean the exposed nylon sides of the cloth. Do not scrub the rubber coated side of the cloth.
4. Rinse the coverall with cool, fresh water.
5. Turn the coverall right side out. Close the slide fastener and scrub the exposed uncoated sides of the cloth. Do not scrub any exposed, rubber coated sides.
6. Rinse well in cool, fresh water. Do not wring or squeeze the garment.
7. Open the entrance slide fastener and hang the coverall on a broad shouldered wooden hanger until the outer surface is dry.
8. Turn the coverall inside out and hang until dry.

Packing

NOTE: The QD-1 coverall must be completely dry before folding and packing the unit.

To pack the QD-1, proceed as follows:

1. Lay out all of the components. Insure that the coverall has been dusted with talcum powder and the slide fastener has been lubricated.
2. Completely deflate the coverall hood and lock the inflation valve closed. Tie through the eyelets on the hood and right pocket with approximately 5 feet of nylon cord (MIL-C-5040, type I). Fake the line across the hood, fold the hood and insert it into the pocket.
3. Insure that the tie cords are attached to the mittens. Fold the mittens in half and insert them into their respective pockets. Snap the pockets closed.

   NOTE: To enable an aircrewman to easily don the QD-1 in an emergency, the entrance slide fastener must be fully opened.
4. Fold the QD-1 and place it in the carrying case as shown in figure 14-3. Snap the case closed.
5. The QD-1 is stowed onboard the aircraft in such a way as to be readily accessible to an aircrewman. However, the bunching of coveralls or stowage near heaters and in places where they will interfere with normal operations is not permitted, as this will damage the coveralls and prevent them from properly sealing. Recommended storage holders for certain type aircraft can be locally fabricated as outlined in NavAir 13-1-6.7.

Leakage Test

All QD-1 coveralls are subjected to a leakage test upon issue and on every other aircraft calendar inspection thereafter; after making repairs; and after their use.

Leakage test fixtures are not normally available through Supply so they must be locally fabricated in accordance with instructions outlined in NavAir 13-1-6.7.

To test a QD-1 coverall for leakage, proceed as follows:

1. Turn the QD-1 coverall inside out for testing.
2. Attach a wrist seal clamp to one wrist.
3. Attach a neck seal clamp.

   NOTE: Rubber padding must be used between the hose clamp and the wrist seal to prevent damage to the seal.
4. Attach the test fixture and fitting to one sleeve. Insure that the rubber padding is in place and then tighten the hose clamp.
5. Close the entrance slide fastener completely.

   NOTE: Do not open the air feed valve when the manometer valve is open.
6. Connect the test fixture to the end fitting. Close all other valves and open the air feed valves. Allow the coverall to inflate. Close the air feed valve and open the manometer valve. Pressure should be 6 inches of water; adjust the pressure as needed.
7. Allow the coverall to remain undisturbed for 5 minutes. Open the measuring device valve and check the pressure. Maximum pressure loss permitted is 1 inch of water.
8. If the final reading is below 5 inches of water, reinflate the coverall to test pressure and, using a soap solution, check for leaks. Mark the leaks with a white china marking pencil.
9. Disconnect the test fixture, rinse any soap solution from the coverall and, if necessary, correct any leaks in accordance with procedures outlined later in this chapter.

Repairs

Repairs to the QD-1 are limited to patching holes to 2 inches diameter and tears or cuts, not across a seam, to 14 inches.

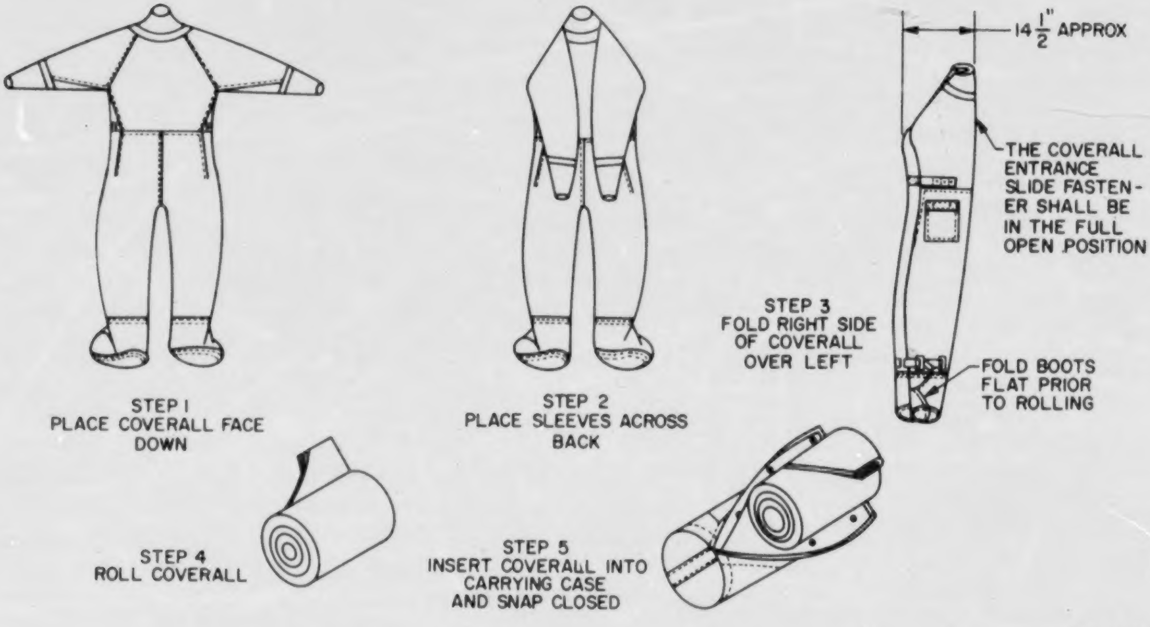
STEP 1
PLACE COVERALL FACE DOWN
STEP 2
PLACE SLEEVES ACROSS BACK
14 1/2" APPROX
THE COVERALL ENTRANCE SLIDE FASTENER SHALL BE IN THE FULL OPEN POSITION
STEP 3
FOLD RIGHT SIDE OF COVERALL OVER LEFT
FOLD BOOTS FLAT PRIOR TO ROLLING
STEP 4
ROLL COVERALL
STEP 5
INSERT COVERALL INTO CARRYING CASE AND SNAP CLOSED

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Figure 14-3.—Folding the QD-1 quick donning anti-exposure flying coverall.

To patch the QD-1, proceed as follows:

1. Cut one patch 2 inches larger than the damage on all sides and one patch 1 1/2 inches larger on all sides.

2. Turn the garment inside out. Clean the larger patch and the area around the damage with toluene.

NOTE: Do not use toluene near heat, sparks, or open flame. Avoid prolonged contact with the skin or breathing of the fumes. Use toluene only in a well ventilated area.

CAUTION: Clean only the coated side of the cloth with toluene.

3. Apply four coats of adhesive to the material and coated side of the patch. Allow 15 minutes between coats. When the last coat of adhesive is tacky, apply the patch to the damage. Roll the patch down firmly to force out trapped air.

4. Dust the patched area with talcum powder and turn the coverall right side out.

5. Apply the outside patch in the same manner. Dust the area with talcum powder.

NOTE: Talcum powder prevents adhesive from bonding. If other areas are to be cemented, avoid getting talcum on those areas. If in doubt about the presence of talcum powder, sponge the area with water first and allow to dry before cementing.

6. Allow the adhesive to cure 24 hours before performing the leakage test.

Packing For Storage

When the QD-1 is placed in storage, it must be packed in accordance with the procedures outlined earlier in this chapter.

Place the packed coverall in a close fitting, air evacuated, heat sealed bag made of barrier material. Place the sealed bag in a close fitting fiberboard container. The bag and container must be marked in accordance with existing instructions and must include the following information:

1. Coverall type and size.
2. Overhaul activity.
3. Date of final test.
4. Date of overhaul.

VENTILATED ANTI-EXPOSURE FLYING COVERALL CWU-33/P

Maintenance procedures for the CWU-33/P are grouped as follows:

1. Preflight inspection.
2. Postflight maintenance.
3. Fourteen day inspection.
4. Periodic inspection.
5. Repairs.
6. Fitting and assembly.
7. Cleaning.
8. Storage.

The schedule of inspection for the CWU-33/P coverall does not apply when the coverall is in seasonal storage.

Preflight Inspection

It is recommended that a qualified Aircrew Survival Equipmentman perform the preflight inspection; however it may be performed by the aircrewman. To perform a preflight inspection, examine the following:

1. Inner and outer assembly for cuts, tears, abrasions, and deterioration.
2. Seams for separation, stitching, cuts, and tears.
3. Inspect for corrosion and proper operation of the entrance, sleeve, and leg slide fasteners.
4. Vent air and anti-g hoses, as applicable, for good condition and security of fittings.
5. Hood and mittens for proper stowage in pockets.

If any discrepancy is noted, the coverall should be subjected to a periodic inspection.

Postflight Maintenance

To perform postflight maintenance, proceed as follows:

NOTE: This maintenance may be performed by the aircrewman.

1. Hang the coverall on a wooden hanger fitted with a nail or screw on each shoulder from which the coverall is hung by the sleeve and leg slide fastener tabs. Insert cellulosic packing material or a suitable substitute at the coverall bend points.
2. Air the coverall in a cool, dry, well ventilated area. Never hang it in direct sunlight.

Fourteen-Day Inspection

To perform a 14-day inspection, examine the following:

1. Inner and outer assembly for cuts, tears, abrasions, and deterioration.
2. Seams for separation, stitching, cuts and tears.
3. Entrance, sleeve, and leg slide fasteners for proper operation and corrosion. (As needed, apply a very light coating of silicone lubricant, to the slide fastener chains.)
4. Inspect the vent air and anti-g hoses for a frayed covering, cracks, damaged or corroded fittings and loose or corroded clamps. Inspect the fittings for looseness by grasping the hose and sharply jerking the fittings.
5. If any discrepancies are noted, the coverall or hoses must be repaired.
6. If excessive odor from perspiration is present or the coverall is soiled, it must be cleaned in accordance with the procedures covered later in this section under the heading "Cleaning."

Periodic Inspection

The CWU-33/P coverall must be inspected every 30 days, prior to placing the garment in storage, and when removed from storage. Repairs are performed in accordance with procedures outlined in NavAir 13-1-6.7. To perform a periodic inspection, inspect as follows:

1. Inspect the inner and outer assembly for cuts, tears, abrasions, or other damage.
2. Seams for separation, stitching, cuts, and tears.
3. Entrance, sleeve, and leg slide fasteners for proper operation and corrosion.

4. Inspect the hook and pile tape for security of attachment.

5. Inspect the vent air and anti-g hoses for frayed covering, cracks, damaged, or corroded fittings, and loose or corroded clamps. Inspect the fittings for looseness by grasping the hose and sharply jerking the fitting.

6. Clean and repair the coverall as required.

Repairs

The following repairs are authorized on the CWU-33/P coverall assembly:

1. Installation of the anti-g fitting.
2. Repairs to holes, tears, and surface cracks.
3. Replacement of entrance, leg, and sleeve slide fasteners.
4. Recementing loose pile tape of the innershell with the required adhesive.
5. Restitching of loose hook and pile tape of the outershell.
6. Recementing loose ventilation spacer panels, ducts, and seam tapes.

INSTALLATION OF ANTI-G SUIT FITTING.–Insure that the area for installation of the fitting is within the reinforced area. To install the anti-g suit fitting, proceed as follows:

1. Punch a 1 1/8-inch diameter hole on the center mark of the reinforced area.

2. Apply two coats of adhesive on both sides of the opening. Allow 15 minutes between coats.

The adhesive must cover a 2 1/2-inch diameter area, centered on the hole. Apply two coats of adhesive to the inner face fitting flange and to the screw washer on the opposite side from the O-ring.

NOTE: One of the sides of the squared opening must be parallel with the coverall side seam or parallel with the deck in order for the hose to lock in the vertical position.

3. Insert the flange so that the threaded portion is on the inside and screw the washer down tightly. Insure that the O-ring is turned away from the cloth.

HOLES, TEARS, AND CRACKS.–To repair holes, tears, and cracks, apply a small amount of neoprene adhesive to the torn edges. Allow a 10-minute tack time, and butt the edges together. Surface cracking can be repaired by applying cement to the affected areas.

REPLACEMENT OF SLIDE FASTENERS.–To replace the slide fasteners, proceed as follows:

1. Remove the hook and pile tape carefully with the use of as little solvent as necessary to prevent severe tearing of the foam material.

2. Cut and remove the stitches of the old slide fastener.

NOTE: Do not stretch the material as it feeds through the sewing machine or the slide fastener will not finish at the desired point.

3. Sew in the new slide fastener.

4. Replace the hook and pile tape.

Fitting and Assembly

The CWU-33/P fitting and assembling is accomplished by qualified personnel and in the sequence listed in the following paragraphs.

NOTE: The full 18 sizes should be in stock at the fitting activity. Exposure protection and mobility can be seriously compromised with improper fitting.

1. If required, the size of a coverall can be customized by reducing the circumference or length of the arms or legs. The circumference of the torso may also be reduced.

2. Determine the total reduction in circumference required.

NOTE: Areas between the spacer panel and ventilation ducts should be used for material cutout. In order to maintain suit symmetry, it is necessary to remove equal amounts of foam material from opposite or adjacent coverall sections unless the material is removed from the seams, as shown in figure 14-4.

If the ventilation system is already installed, portions can be peeled up, necessary cutouts made, and recemented in place.

3. Using a razor or knife, cut out the sections of foam. The width of the section(s) should equal the reduction in circumference, and the length of the section should be tapered to eight times the width. The maximum width of any one cut must be no greater than 1 inch. Two or

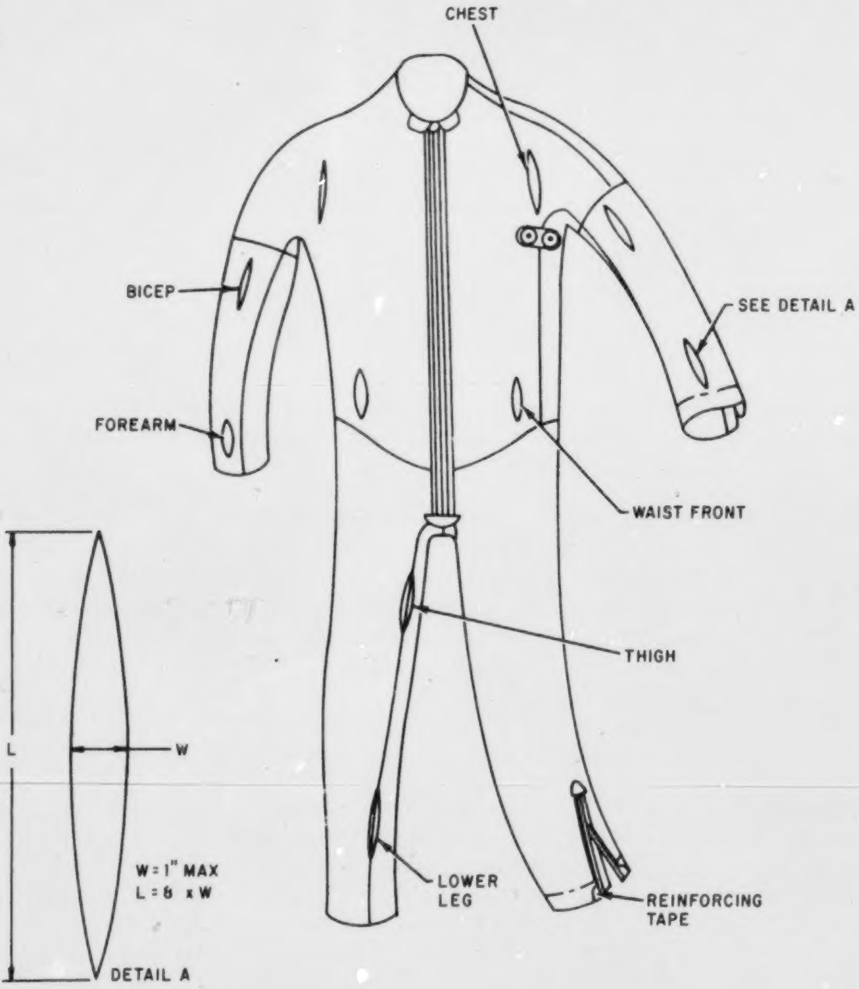
CHEST
BICEP
SEE DETAIL A
FOREARM
WAIST FRONT
THIGH
L
W
W = 1" MAX
L = 6 x W
LOWER LEG
REINFORCING TAPE
DETAIL A

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Figure 14-4.—Customizing the CWU-33/P or 9/P coverall.

more sections must be cut out for reductions larger than 1 inch. For example, to remove 2 inches from the waist, remove 1/2 inch from the left front panel, 1/2 inch from the right front panel, and 1/2 inch from each side of the back panel. An alternate method would be to remove 1 inch from the right side seam and 1 inch from the left side seam if there is little interference with the vent system components.

4. Apply two coats of neoprene adhesive to the cut edges. Allow 10 minutes between coats.

5. When the second coat of adhesive is tacky, butt the edges together. The edges will adhere immediately, forming a weld.

6. Cement a length of rubber tape over the weld on the inside of the coverall. Extend the tape over the weld 1/2 inch on each end.

7. Allow 24 hours for the adhesive to cure before the coverall is donned.

8. Arms and legs can be shortened by cutting away the foam material and slide fastener chain to the desired length and installing new slide fastener stops and tape reinforcement. The arms and legs must not be shortened more than 2 inches since excessive shortening will affect the calf and forearm fit.

9. Affix the individual aircrewman's identification on the outershell, using the nameplate mounting area. An identical size of nameplate hook tape must be used when mating with the pile tape.

Procedures required for fitting the CWU-33/P vent air hose and specific aircraft application is outlined in NavAir 13-1-6.7.

Cleaning

To clean the CWU-33/P coverall proceed as follows:

1. Clean the innershell by shower washing with a mild soap.

NOTE: Do not wring the innershell; do not damage the spacer panels and ventilation ducts.

2. To dry the innershell, hang the garment on a wooden hanger fitted with a nail or screw on each shoulder from which the coverall is hung by the sleeve and leg slide fastener tabs. Hang in a dry, well ventilated area. Do not dry the coverall in direct sunlight.

3. The outershell can be laundered without losing its fire resistant properties.

4. Immerse the outershell in a mild detergent and lukewarm, fresh water solution and allow to soak for 5 minutes. Agitate by hand gently for 2 minutes. Drain.

5. Rinse the coverall in cool, fresh water. Drain. Squeeze the water out; do not wring.

6. To dry the outershell, drip dry or tumble dry at a mild temperature not to exceed 180 degrees F.

Storage

When storing the CWU-33/P coverall, the inner and outershell must remain attached. Sufficient quantity of cellulosic material must be inserted at the folds to prevent surface cracking of the innershell. All slide fasteners must be in their fully closed position. Hang the coverall on a wooden hanger by the sleeve and leg slide fastener tabs.

VENTILATED WET SUIT CWU-9/P ANTI-EXPOSURE COVERALL

General maintenance procedures for the CWU-9/P wet suit coverall are the same as those discussed for the CWU-33/P flying coverall.

Repairs to holes and tears on the CWU-9/P can be made by applying a small amount of neoprene adhesive to the torn edges; allowing a 10 minute tack time, and butting the edges together. Surface cracking can be repaired by applying cement to the affected areas. Seriously damaged areas are repaired by the replacement of applicable sections. Loose spacers, seam tapes, or ducts can be recemented; anti-g or ventilated fittings can be replaced.

It should be noted that availability of the CWU-9/P wet suit will be diminished pending receipt of the CWU-33/P suit into the personnel protective equipment inventory.

Fitting and assembly of the CWU-9/P wet suit coverall is accomplished by qualified Aviation Physiological Training Unit (APTU) personnel.

Cleaning of the CWU-9/P suit coverall is accomplished by scrubbing the wet suit with a soft bristled brush in a solution of mild soap and water. After scrubbing, the coverall must be rinsed several times with clear, fresh water and hung on a broad-shouldered, wooden hanger to drip dry.

INTEGRATED CLOTHING AND LIFE PRESERVERS

Integrated clothing and life preservers vary in type, configurations, and application to aircraft. All naval aircraft utilizing the seat ejection escape system provide for integration of the aircrewman's parachute harness, lap belt assembly, and shoulder restraint system. The MA-2 torso harness suit serves as the integration assembly and provides maximum mobility to the aircrewman while offering restraint, in case of an emergency, and a parachute harness, in case of ejection or bailout. Additionally, the torso harness

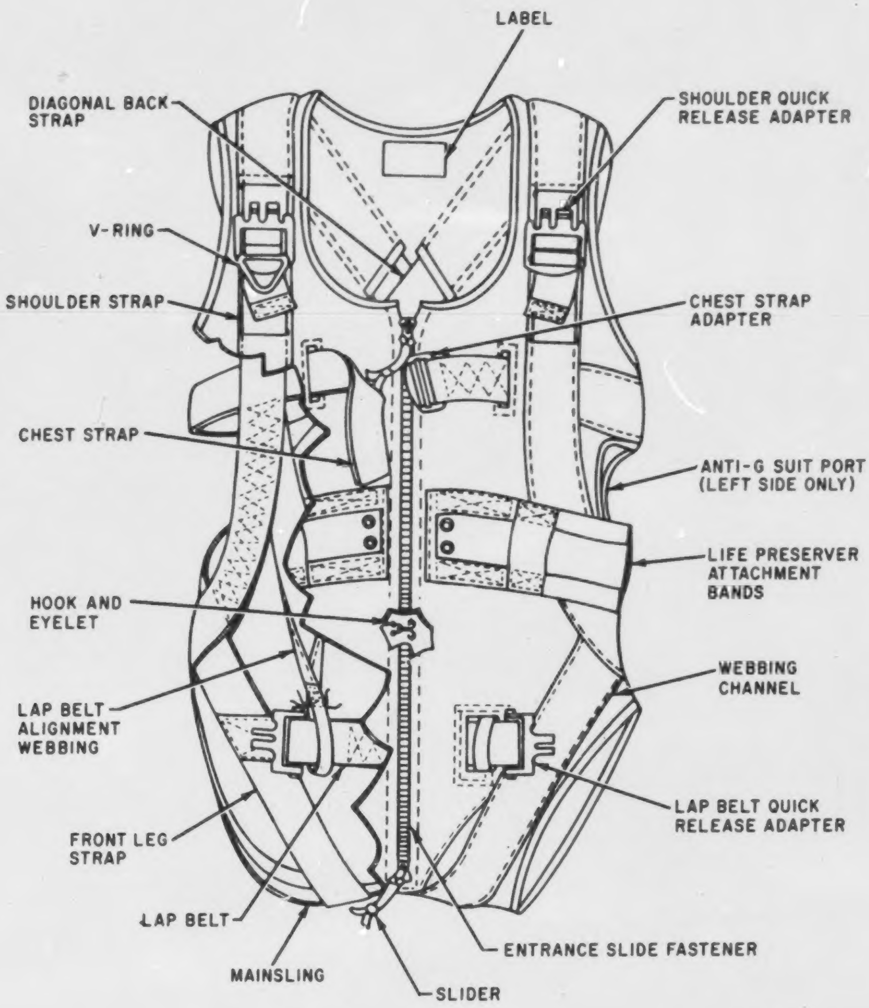
LABEL
DIAGONAL BACK STRAP
SHOULDER QUICK RELEASE ADAPTER
V-RING
SHOULDER STRAP
CHEST STRAP ADAPTER
CHEST STRAP
ANTI-G SUIT PORT (LEFT SIDE ONLY)
LIFE PRESERVER ATTACHMENT BANDS
HOOK AND EYELET
WEBBING CHANNEL
LAP BELT ALIGNMENT WEBBING
LAP BELT QUICK RELEASE ADAPTER
FRONT LEG STRAP
LAP BELT
ENTRANCE SLIDE FASTENER
MAINSLING
SLIDER
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Figure 14-5.—MA-2 torso harness suit, parts nomenclature.

allows for the use of a life preserver and the SV-2A survival vest.

MA-2 TORSO HARNESS SUIT

The MA-2 torso harness suit consists of a nylon webbing harness encased in nylon fabric panels, as shown in figure 14-5.

Shoulder quick release adapters provide for attachment of the parachute riser assemblies. Lap belt adapters, attached to a length of webbing across the abdomen, provide for attachment of the lap belt and survival kit. The suit is closed by a slide fastener positioned at the front. Hooks and eyelets are installed under the slide fastener to partially close the entrance, relieving

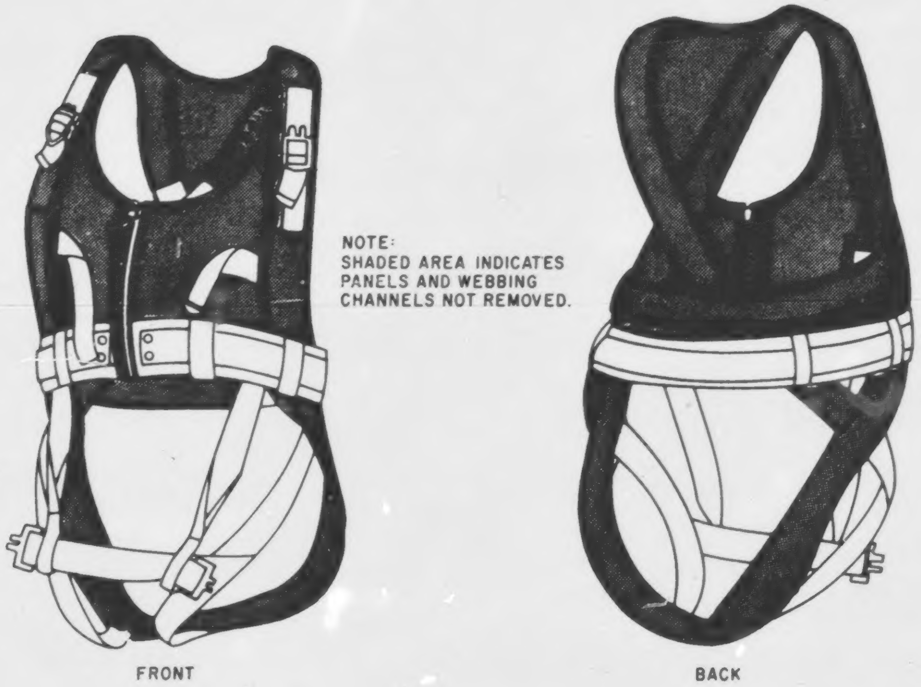

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Figure 14-6.–MA-2 cutaway modified torso harness suit.

strain on the slide fastener and facilitating closure. An adjustable chest strap provides final adjustment of the suit and necessary chest restraint. The chest strap is secured by a friction adapter and hook and pile tape. A V-ring is provided at the right shoulder adapter to allow for attachment of an LR-1 retaining line and a helicopter hoist.

The MA-2 torso harness suit is available in 12 sizes, ranging from small short to extra large long.

The MA-2 (cutaway modified) shown in figure 14-6 is approved for use and is fabricated from an MA-2 by cutting away nonstructural nylon cloth. This is done to improve comfort in warmer climate operations and does not decrease either function or reliability of the assembly. The MA-2, cutaway modified, is fabricated at discretion of the individual aircrewman.

Fitting

The MA-2 must fit the aircrewman properly to provide maximum comfort and protection. When properly fitted, the suit should be snug but not binding, the mainsling should pass under the buttocks, and the chest strap should cross the center of the chest, not near the collar bone.

For use with bulkier winter flight clothing, it may be necessary to use a larger size MA-2 than with the summer flying coveralls.

Inspection

The MA-2 preflight check is accomplished prior to each flight and at intervals not to exceed 2 weeks. This check is accomplished by the aircrewman. To perform a preflight check, proceed as follows:

1. Inspect the fabric and webbing for cuts, tears, open seams, loose or broken stitching, and contamination.
2. Inspect the hardware for corrosion, cracks, and security.
3. Inspect the entrance slide fastener for security of installation and proper operation.

The original issue/periodic inspection of the MA-2 is performed upon issue and at intervals not to exceed 91 days thereafter. Normally, the torso suit is inspected at the same time as the aircrewman's life preserver. The original issue/periodic inspection consists of the following:

1. Service life check.
2. Contamination check.
3. Cleaning.
4. Inspection.
5. Updating configuration.

SERVICE LIFE CHECK.–The service life of the MA-2 is 7 years from the date it was placed in service or 8 1/2 years from the date of manufacture, whichever occurs first. When an MA-2 assembly reaches its service life limit, it must be removed from service and forwarded to supply for disposition. When an MA-2 is removed from service, all parachute and lap belt adapters will be removed, screened and, if still serviceable, returned to supply.

The date of manufacture for the MA-2 is located on the inside, right, front leg strap. When the MA-2 is placed in service, the date must be stenciled in the center of the lap belt strap outer surface using black marking ink. "5-69" would indicate that the MA-2 was placed in service in May, 1969. When an in-service MA-2 lacks a start-of-service date, the service life must expire 7 years from the date of manufacture.

CONTAMINATION CHECK.–To check an MA-2 for acid or alkaline contamination, proceed as follows:

NOTE: A pH reading of 5.0 to 9.0 is in the safe zone. Readings below 5.0 indicate excess acidity, and readings above 9.0 indicate excess alkalinity. Insure that the area to be tested is isolated from any source of contamination which can result in erroneous readings. Handle the test paper by the edges or one end only to avoid false readings.

1. Dampen the suspected contaminated area with distilled water.
2. Place a piece of full range test paper (0.0 to 14.0 pH) on the dampened area. A color change will indicate the approximate pH reading and which specific short range test paper to use.
3. Place the short range test paper indicated in step 2 on the dampened area. The color change indicates the pH factor of the affected area. By matching the test strip with the applicable range color chart supplied with the kit, acid or alkaline strength can be determined.
4. If acid contamination is found, the assembly must be considered nonrepairable and forwarded to supply.
5. If alkaline contamination is found, the MA-2 assembly must be rinsed in cool, fresh water until a safe reading is obtained. All fabric and webbing must then be carefully inspected for any sign of deterioration.

CLEANING.–The MA-2 must be cleaned as often as required to remove perspiration stains, dirt, and other stains which may degrade performance of the assembly. To clean an MA-2, proceed as follows:

1. Wrap all metal fittings in heavy flannel cloth.

NOTE: Do not scrub the MA-2 torso harness suit.

2. Soak the MA-2 assembly in cool, fresh water for 2 to 3 hours to loosen any set stains.
3. Drain, do not wring, and immerse the MA-2 in a tub of fresh water, not over 120 degrees F. Gently agitate by hand.
4. After 5 to 10 minutes, drain the assembly and clean the tub.
5. Repeat steps 3 and 4 twice.
6. Petroleum and other stubborn stains may be removed by repeated applications of a mild soap and water solution.
7. Hang the MA-2 on a wooden hanger until dry.

INSPECTION.–To inspect an MA-2, perform the following:

1. Check the chest strap friction adapter for corrosion, distortion, cracks, presence of the locking bar, sharp edges, and security of the attachment.

2. Inspect the shoulder quick-release adapter for corrosion, distortion, presence of the locking bar, sharp edges, routing of the webbing, and security of the pin and locking screw. Insure that the slot head screw is installed and the red lacquer tamper dot is intact.
3. Inspect the lap belt quick-release adapter for corrosion, distortion, sharp edges, and security of attachment.
4. Check the sliding metal fittings located at the rear inside of the suit for corrosion, distortion, cracks, and sharp edges.
5. Check the entrance slide fastener for corrosion, missing teeth, presence of sliders (single slider on the MA-2 cutaway modified), security of attachment, and ease of operation.
6. Inspect the eyes and hooks at the entrance for damage and security of attachment.
7. Inspect the V-ring at the right shoulder for corrosion, distortion, cracks, and sharp edges.
8. Check the life preserver retention system for cuts, rips, frayed or weakened webbing, security of stitching, and presence and condition of snap fasteners.
9. Inspect the fabric panels for cuts, tears, fraying, deterioration, and security of stitching.
10. Inspect the harness webbing for cuts, tears, fraying, deterioration, and security of stitching.
11. Repair any discrepancies and update the MA-2 configuration in accordance with procedures outlined in NavAir 13-1-6.7.

General repair on the MA-2 consists of replacement of the hardware, repair of cloth, and repair of harness webbing. Do not replace any hardware which requires upstitching of the harness webbing. Harnesses that are severely damaged must be discarded. Loose or broken stitching in excess of three stitches must not be repaired. Damage to harness webbing, other than three or less stitches loose or broken, may not be repaired.

For more detailed information concerning repairs and modifications to the MA-2 and cutaway modified torso harness suits, refer to NavAir 13-1-6.7.

LIFE PRESERVERS

Life preservers are designed to be comfortable when worn in flight. To accomplish this, the preserver is worn in its deflated state which permits the wearer all the freedom of movement necessary for the performance of his duties. When inflated, the preserver must give adequate and properly distributed buoyancy.

LPA-1/1A Life Preserver Assembly

A visual comparison of the LPA-1 and LPA-1A life preserver assemblies shown in figure 14-7 will reveal the following: Trim of the LPA-1A collar lobe is rounded, the LPA-1A case assembly section enclosing the collar lobe is larger, the inspection record patch material and method of attaching the delivery tube to the collar lobe are different. Not visible are the LPA-1A internal design changes.

The LPA-1/1A life preserver assembly weighs 4 pounds (without survival equipment) and provides a minimum of 65 pounds of buoyancy. It is designed so that it will not interfere with the removal of the nonintegrated parachute harness and is compatible with all forms of naval flight clothing. The LPA-1/1A life preserver assembly consists of a two-compartment flotation assembly, a casing assembly, and two inflation assemblies. Optional survival equipment pouches may be attached to the casing assembly with snaphooks or tied with a binder knot using type I cord.

Component or survival items and quantities required to make up the LPA-1/1A life preserver assembly are listed in table 14-1.

Table 14-1.–LPA-1/1A components and survival items.

Component or survival item	Quantity required
Inflatable life preserver, LPA-1/1A . .	1
Carbon dioxide cartridge, Type II . . .	2
Inflation valve, Type II	2
Casing assembly LPA-1	1
Casing assembly LPA-1A	1
Flare pouch assembly[1]	1
Dye marker pouch assembly[1]	1
Signal, Smoke and Illumination, Marine MK-13 Mod 0[1]	2
Dye marker[1]	2

[1] Optional equipment at the discretion of the squadron commander.

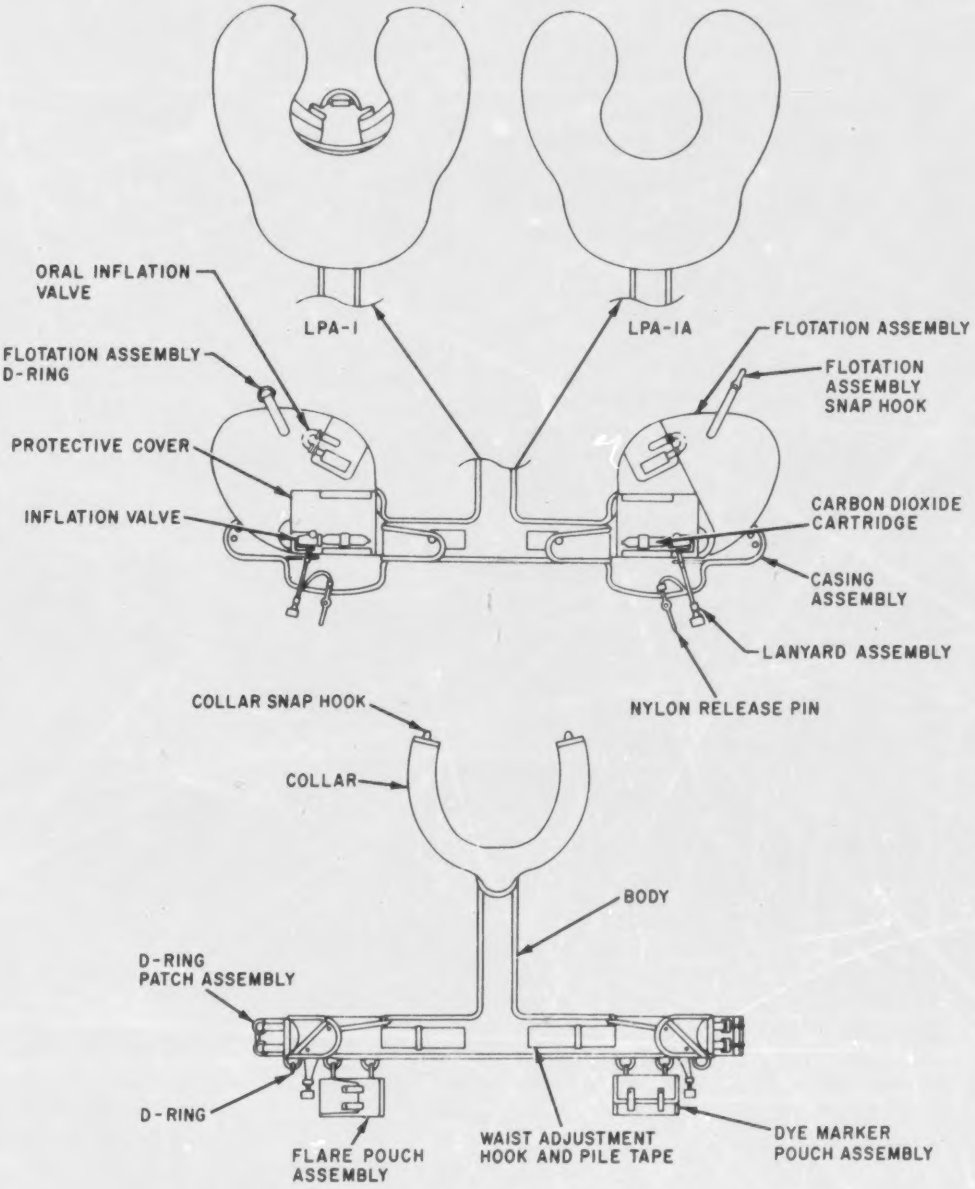
ORAL INFLATION VALVE
LPA-I
LPA-IA
FLOTATION ASSEMBLY
FLOTATION ASSEMBLY D-RING
FLOTATION ASSEMBLY SNAP HOOK
PROTECTIVE COVER
CARBON DIOXIDE CARTRIDGE
INFLATION VALVE
CASING ASSEMBLY
LANYARD ASSEMBLY
COLLAR SNAP HOOK
NYLON RELEASE PIN
COLLAR
BODY
D-RING PATCH ASSEMBLY
D-RING
FLARE POUCH ASSEMBLY
WAIST ADJUSTMENT HOOK AND PILE TAPE
DYE MARKER POUCH ASSEMBLY

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Figure 14-7.–LPA-1/1A life preserver assembly, parts nomenclature.

All required components that are not supplied with the preserver must be individually requisitioned.

The flotation assembly is constructed of chloroprene coated nylon cloth and forms three lobes joined by tubes; the right waist lobe, the collar lobe, and the left waist lobe. Half of the right waist lobe and the collar lobe comprises one compartment. This compartment is serviced by the oral inflation valve and the inflation assembly attached to the right waist lobe. The left waist lobe and the remaining half of the right waist lobe comprise the second compartment. It is serviced by the oral inflation valve and the inflation assembly attached to the left waist lobe.

The flotation assembly is also equipped with a snaphook on each end of the collar lobe, a snaphook on the right waist lobe, a D-ring on the left waist lobe, an attachment patch on each waist lobe, and an inspection record patch on the collar lobe. Parachute risers must be routed outside of the collar lobe when attaching the collar lobe snaphooks to flight clothing at the chest. The snaphook and D-ring on the waist lobes are used to secure the waist lobes together after inflation.

Each attachment patch is secured to the casing assembly by means of six rivets.

The casing assembly is constructed of rubber-coated nylon cloth; it protects the flotation assembly and provides for attachment of the preserver assembly to the wearer's flight clothing. The casing assembly is made up of the casing, an adjustable webbing belt, a connecting assembly, six belt-keepers, and six D-rings. One-inch and 5/8-inch hook and pile tapes are used to secure the casing around the folded collar lobe, and to close the bottom edge of the waist portion of the casing. Hook and pile tape attached to the waist portion of the casing is used to adjust the casing waist size. The folded waist lobes are stowed under the casing flaps. These flaps are secured by nylon retaining pins attached to the inflation assembly lanyards.

The webbing belt, attached through the back of the casing to the connecting assembly, adjusts from a waist size of 30 to 43 inches. The connecting assembly, which consists of two D-rings and two snaphooks, is attached to the casing. It is used to secure the casing around the wearer's waist and is backed by a webbing pad to provide comfort for the wearer. The belt-keepers, attached to the inboard side of the casing, are used to secure the casing to the wearer's flight clothing at the waist. A D-ring is attached to the belt-keeper. Flare and dye marker pouches, the life raft retaining line and other accessories may be attached to these D-rings.

Each inflation assembly is made up of a carbon dioxide cartridge and an inflation valve and is connected to a valve stem attached to each waist lobe. Each valve stem is equipped with a removable check which prevents leakage.

The LPA-1/1A is manually inflated by pulling both inflation assembly lanyards down and forward at the same time. The lanyards remove the nylon retaining pins securing the casing flaps and operate the inflation valves. The hook and pile tapes securing the casing around the collar lobe will then release as the collar lobe inflates.

When the inflation assembly lanyards cannot be pulled at the same time, the lanyard on the right side should be pulled first.

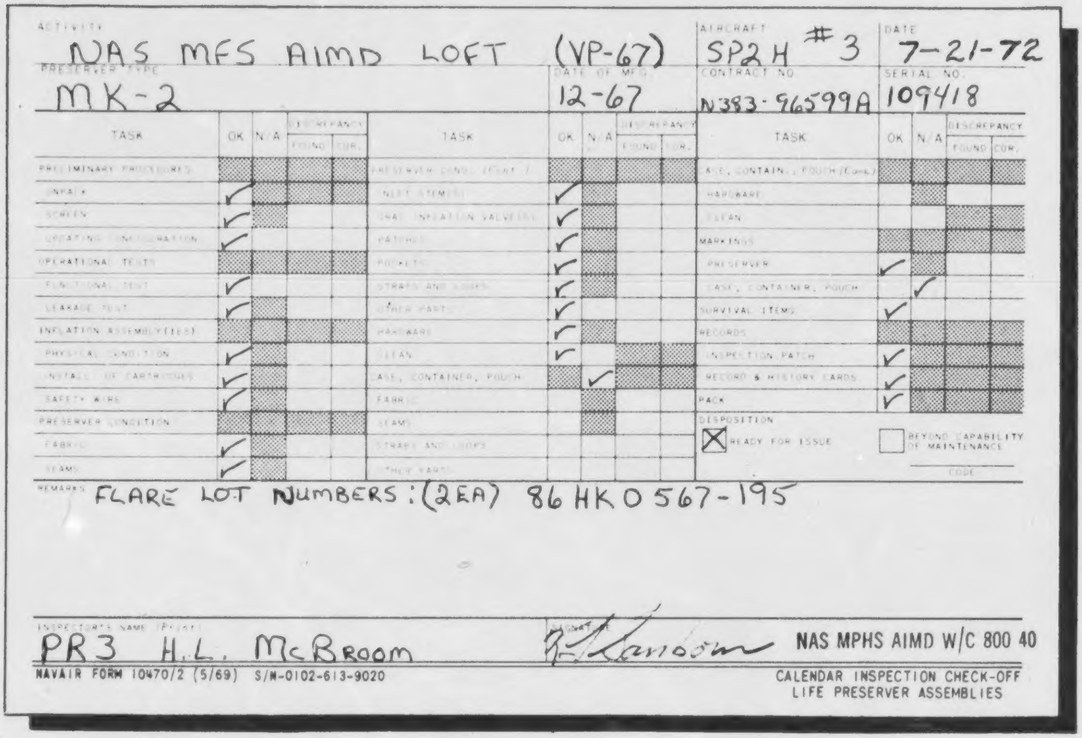
The LPA-1/1A is not designed for inflation through the oral inflation valves. In an emergency situation, the oral inflation valves should be used to top-off an inflated preserver, maintain inflation of a leaky preserver, or inflate a compartment if an inflation assembly malfunctions or fails. However, the oral inflation valves are used to inflate a preserver with air during an inspection test or to deflate a preserver in preparation for packing.

NOTE: The casing must be opened and the flotation assembly unfolded prior to inflating a preserver through the oral inflation valves.

As LPA-1/1A life preserver assemblies become available, they will be used to replace all MK-2 and MK-3C life preservers. MK-2 and MK-3C preservers must then be returned to supply.

INSPECTION AND MAINTENANCE.–All inflatable survival equipment must be subjected to periodic inspection and maintenance. As these tasks provide the primary assurance of survival equipment functioning properly, no instance of carelessness or willful neglect will be allowed to pass unnoticed.

In order to avoid duplication concerning life preserver inspection and maintenance, the



ACTIVITY NAS MFS AIMD LOFT (VP-67)
AIRCRAFT SP2H #3
DATE 7-21-72
PRESERVER TYPE MK-2
DATE OF MFG. 12-67
CONTRACT NO. N383-96599A
SERIAL NO. 109418

TASK	OK	N/A	DISCREPANCY		TASK	OK	N/A	DISCREPANCY		TASK	OK	N/A	DISCREPANCY	
			FOUND	COR.				FOUND	COR.				FOUND	COR.
PRELIMINARY PROCEDURES					PRESERVER COND. (Cont.)					CASE, CONTAIN., POUCH (Cont.)				
UNPACK	✓				INLET STEM(S)	✓				HARDWARE				
SCREEN	✓				ORAL INFLATION VALVE(S)	✓				CLEAN				
UPDATING CONFIGURATION	✓				PATCHES	✓				MARKINGS				
OPERATIONAL TESTS					POCKETS	✓				PRESERVER	✓			
FUNCTIONAL TEST	✓				STRAPS AND LOOPS	✓				CASE, CONTAINER, POUCH		✓		
LEAKAGE TEST	✓				OTHER PARTS	✓				SURVIVAL ITEMS	✓			
INFLATION ASSEMBLY(IES)					HARDWARE	✓				RECORDS				
PHYSICAL CONDITION	✓				CLEAN	✓				INSPECTION PATCH	✓			
INSTALL. OF CARTRIDGES	✓				CASE, CONTAINER, POUCH		✓			RECORD & HISTORY CARDS	✓			
SAFETY WIRE	✓				FABRIC					PACK	✓			
PRESERVER CONDITION					SEAMS					DISPOSITION				
FABRIC	✓				STRAPS AND LOOPS					☒ READY FOR ISSUE	☐ BEYOND CAPABILITY OF MAINTENANCE			
SEAMS	✓				OTHER PARTS						CODE			

REMARKS FLARE LOT NUMBERS: (2EA) 86HK0567-195

INSPECTOR'S NAME (Print) PR3 H.L. McBROOM
SIGNATURE Ransom
NAS MPHS AIMD W/C 800 40

NAVAIR FORM 10470/2 (5/69) S/N-0102-613-9020
CALENDAR INSPECTION CHECK-OFF
LIFE PRESERVER ASSEMBLIES

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Figure 14-8.—Life preserver inspection checkoff form.

procedures discussed in this section will apply to all types of life preservers, except where noted.

An inspection checkoff form is provided for life preservers as shown in figure 14-8. It provides a logical sequence for the inspection and maintenance of inflatable survival equipment. Additionally, it provides for notation of life preserver disposition and for remarks. As each task is completed, a checkmark must be placed in the corresponding "OK" or "DISCREPANCY FOUND" box as applicable. If a task is not applicable, then the corresponding "N/A" box must be checked. When a discrepancy that is related to an inspection task is corrected, the appropriate "DISCREPANCY CORRECTED" box must be checked.

The collateral duty inspector must sign the checkoff forms next to the inspector's name. After inspection, the checkoff form is forwarded to the custodian of the History Card and filed with the History Card.

Disposition of equipment must be indicated by checking either the "READY FOR ISSUE" or "BEYOND CAPABILITY OF MAINTENANCE" block. If beyond capability of maintenance, the appropriate entry must be made in the "CODE" space. For description of codes, refer to OpNav 4790.2 (Series) Appendix G, Naval Aviation Maintenance Program Manual or the Work Unit Code Manual.

The remarks section denotes any discrepancy found in the inspection and, if applicable, the notation that the condition was corrected.

The History Card for inflatable survival equipment contains information pertinent to a particular assembly of inflatable survival equipment.

In addition to the information required on the card, the inspection cycle interval must be entered in the upper, left-hand corner of the card face.

The History Card, shown in figure 14-9, is a permanent record and, when completed, should be affixed to a new card. If an assembly is transferred to another unit, the History Card must accompany it.

Shop Process Cards contain minimal shop procedures. Clearances, tolerances, diagrams, and equipment required are included. The Shop Process Cards are arranged in a logical sequence to aid the Aircrew Survival Equipmentman. Each step includes a paragraph number refering to NavAir 13-1-6.1.

The two basic inspections of life preservers are the preflight check and calendar inspection. The preflight check is accomplished at the Organizational maintenance level or by the aircrewman to whom the preserver is assigned. Unless operational requirements demand otherwise, the calendar inspection is accomplished at the Intermediate maintenance level or above by qualified personnel.

The interval between preflight checks must not exceed 2 weeks. Life preservers must be calendar inspected every 13 weeks. Preservers intended for passengers and stowed aboard passenger aircraft must be calendar inspected during the aircraft's periodic check, but not to exceed 30 weeks.

To perform a preflight check of a life preserver, proceed as follows:

NOTE: Do not open any sealed or safety-wired portions of the preserver for a preflight check.

1. Inspect the exposed metal parts for corrosion and damage.
2. (MK-2 and MK-IV preservers) Inspect the inflation assembly and safety-wire. Unscrew the carbon dioxide cartridge(s) and insure that the seal is not punctured. Replace the cartridges and screw them down tightly.
3. (MK-2 and MK-IV preservers) Inspect the seams and harness for wear, snags, tears, and abrasions.
4. (LPA-1/1A, LPP-1, MK-2 and MK-IV preservers) If the survival items are used, inspect for presence, security of attachment and, if applicable, operation.
5. (LPA-1/1A and MK-3C preservers) Inspect the container fabric for cuts, tears, abrasions, security of stitching, and other damage.
6. (LPA-1/1A preserver) Inspect safety-ties on the release pins and the lanyards (at grommets) on the carrying case. The lanyard safety-ties may be replaced without removing the preserver from service.
7. (MK-3C preserver) Inspect safety-ties on the release pins.
8. (LPA-1/1A preserver) Inspect the rivets securing the flotation assembly to the casing for presence and security of the attachment.
9. (LPA-1/1A preserver) Inspect the hook and pile tape closure at the collar for separation, fasten as necessary.
10. (LPA-1/1A preserver) Adjust and don the preserver to insure a proper fit.
11. (LPP-1, MK-2 preserver) Inspect and test the whistle.
12. If any discrepancy is noted, the preserver must be removed from service and repaired.

To perform a calendar inspection, the procedures detailed present a logical sequence for a proper inspection. Furthermore, at critical steps in the inspection procedure, quality assurance steps will require the assistance of a collateral duty inspection prior to proceeding to the next step.

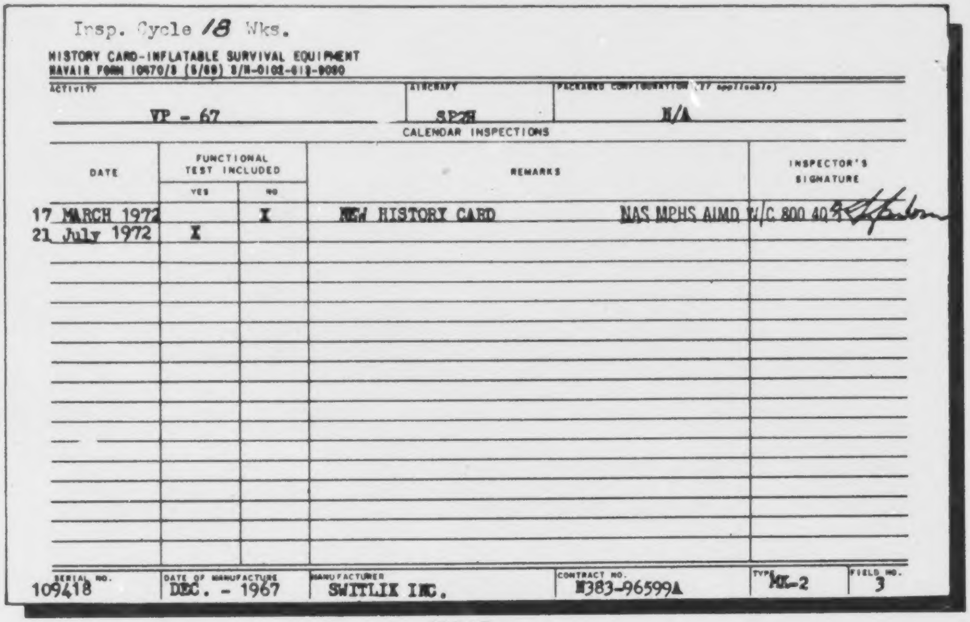
NOTE: At the time of issue and every fourth inspection thereafter, the preserver must receive a functional test. All other inspection tasks will be performed every calendar inspection.

The calendar inspection consists of the following tasks:

1. Preliminary procedures.
2. Functional inspection.
3. Visual inspection.
4. Leakage test.
5. Records and updating.
6. Repacking.

NOTE: Procedures apply to all equipment unless a specific type is described in front of a particular step.

Preliminary procedures consist of inspecting the case, container and/or pouch, and screening.



Insp. Cycle 18 Wks.

HISTORY CARD-INFLATABLE SURVIVAL EQUIPMENT
NAVAIR FORM 10470/3 (5/69) S/N-0102-612-9080

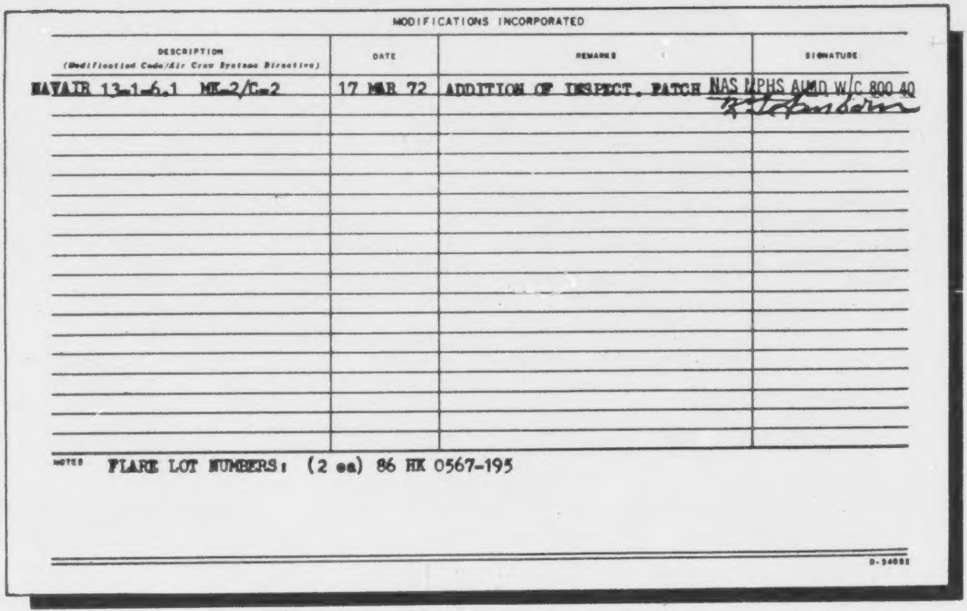
ACTIVITY	AIRCRAFT	PACKAGED CONFIGURATION (If applicable)
VP - 67	SP2H	N/A

CALENDAR INSPECTIONS

DATE	FUNCTIONAL TEST INCLUDED		REMARKS	INSPECTOR'S SIGNATURE
	YES	NO		
17 MARCH 1972		X	NEW HISTORY CARD NAS MPHS AIMD W/C 800 40	
21 July 1972	X			

SERIAL NO.	DATE OF MANUFACTURE	MANUFACTURER	CONTRACT NO.	TYPE	FIELD NO.
109418	DEC. - 1967	SWITLIK INC.	N383-96599A	MK-2	3

FRONT



MODIFICATIONS INCORPORATED

DESCRIPTION (Modification Code/Air Crew Systems Directive)	DATE	REMARKS	SIGNATURE
NAVAIR 13-1-6.1 MK-2/C-2	17 MAR 72	ADDITION OF INSPECT. PATCH	NAS MPHS AIMD W/C 800 40

NOTES FLARE LOT NUMBERS: (2 ea) 86 HK 0567-195

REAR

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Figure 14-9.—Inflatable survival equipment History Card.

To inspect the case, container and/or pouch, examine the following:

1. Fabric for cuts, tears, deterioration, and abrasion.
2. Seams for proper adhesion or stitching.
3. Straps and loops for security and wear.
4. Any other parts for wear, damage, and security.
5. All hardware for security of attachment, corrosion, damage, wear and, if applicable, ease of operation.
6. Collateral duty inspectors must examine the condition of the case, container, and/or pouch exterior for contamination and wear. If any discrepancies are found, the case, container, and/or pouch must be locally repaired or removed from service and replaced.

The preserver and associated equipment must be screened by laying out the assembly in a clean area, free of foreign objects. The preserver must be inspected for obvious defects such as cuts, tears, ruptured seams, and damaged inlet valves.

If screening indicates damage which is beyond the capability of maintenance, the appropriate entry must be made on the Inspection Check-Off Form and the entire assembly returned to supply.

NOTE: Patching of holes, tears, cuts, or punctures 1 inch square or less are the only repairs authorized on a life preserver.

The functional inspection must be performed at the time of issue and every fourth inspection thereafter. Insure that the area surrounding the preserver is free of foreign objects and proceed as follows:

1. (LPA-1/1A preserver) Completely open the preserver casing prior to conducting the functional inspection. Both release pins must be removed from their respective loops, the collar hook and pile tape fasteners should be separated, and the waist and collar lobes completely unfolded and laid out.
2. Actuate the inflation assembly(ies).
3. The preserver must fully inflate to design shape, without evidence of restriction, in less than 30 seconds.
4. If the preserver does not properly inflate, determine the cause of failure and enter the reason in the remarks area of the Inspection Check-Off Form.

Forward the defective preserver to supply.

5. If correction is made, the preserver must be functionally tested again.

Deflation of a life preserver requires the use of a rotary vacuum pump or equivalent and a 3/8- or 1/2-inch inside diameter rubber hose. For deflation of the preserver proceed as follows:

1. Attach one end of the rubber hose to the vacuum pump.
2. Deflation through the oral inflation valves. Unlock the oral inflation valve, hold it in the open position, and hold the vacuum pump hose against the end of the oral inflation valve. When the compartment is collapsed, release the oral inflation valve. Screw the lock closed on the LPP-1, LPA-1/1A, MK-3C, and MK-IV life preservers. Do not screw the lock closed on the MK-2 life preserver.
3. Deflation through the inflation valve (MK-2 life preserver only). Remove the carbon dioxide cylinder and place the vacuum pump hose against the open end of the valve. When the compartment is collapsed, remove the hose and replace with a charged carbon dioxide cylinder.

The visual inspection consists of the following:

1. Life preserver condition.
2. Life preserver configuration.
3. Markings inspection.
4. Survival items inspection.
5. Inflation assembly inspection.

When visually inspecting the life preserver condition, the preserver must be inflated with air to 1 psig. Examine the life preserver for the following:

1. Preserver fabric for cuts, tears, punctures, deterioration, and abrasions.
2. Seam tapes for proper adhesion.
3. Valve inlet stems for security.
4. Oral inflation valve(s) for cracks, security, ease of operation, and corrosion.
5. Patches for proper adhesion and wear.

6. Pockets for proper adhesion, wear, cuts, or other damage.
7. Straps and loops for proper adhesion and fraying.
8. Any other parts for wear or damage.
9. All hardware for security of attachment, corrosion, damage, wear and, if applicable, ease of operation.
10. Preservers for stains, dirt, and general cleanliness.
11. (LPP-1) Plastic snap fasteners on the toggle assembly pouch for damage and security of attachment.
12. Cross threading and/or loose manifold nuts.
13. (LPA-1/1A) Inner surface of casing assembly for deterioration or gum substance.
14. (LPA-1/1A) Flare pocket and/or dye marker pouch snap hooks for damage and security of attachment.
15. (LPA-1/1A) Chafing and deterioration on the lower portion (front and back) of the waist lobes.

The life preserver's configuration must be updated by comparing it to the applicable configuration illustrations and applicable modification tables as outlined in NavAir 13-1-6.1.

Inspect, update, and restore all markings using wash proof black ink.

To inspect the survival items, proceed as follows:

1. Inventory all items by checking the applicable table listed in NavAir 13-1-6.1. Replace any missing item.
2. Inspect all items for damage, spent contents, and expired service life. Replace as necessary.

NOTE: Do not attempt to replace the bulb or battery of salt water activated lights on the LPP-1 life preservers. Replace the entire assembly as no replacement parts are authorized.

To inspect the life preserver inflation assemblies, proceed as follows:

1. Remove the carbon dioxide cartridge from the valve assembly. If the cartridge is discharged, replace it.
2. Examine the inflation valve, the actuating lever, and lanyard for fraying, corrosion, or other damage.
3. If required, remove any sharp edges from the valve with a fine round file.
4. Operate the toggle 3 or 4 times. Insure that the lever moves freely and that the puncturing pin moves properly inside the valve body.
5. If any discrepancy is noted in the valve, remove the valve assembly by removing the cap nut. Install a new inflation valve and use new washers when making the replacement.
6. (MK-3C preserver) Check the position of the inflation assembly for correct alinement.

All life preservers must be subjected to a 4-hour leakage test (per flotation chamber) each calendar inspection. The flotation chambers of each life preserver must be tested in the following sequence:

LPA-1/1A–Test each chamber separately.
MK-2–Test the two outer chambers simultaneously and the inner chamber separately.
MK-3C–Test both chambers at the same time.
MK-IV–Test each chamber separately.

NOTE: Life preservers should not be disturbed during their leakage test.

To perform the leakage test, a test fixture, as illustrated in NavAir 13-1-6.1, must be locally fabricated.

Insure that the area surrounding the preserver is clear of foreign objects, and proceed as follows:

1. Insure that all carbon dioxide has been removed from any preserver which has been inflated.

CAUTION: The measuring device must be closed when the air feed valves are open.

NOTE: To convert pressure from inches of mercury to psig, multiply inches by 0.49.

2. (MK-2 preserver outer compartment) Remove the carbon dioxide cylinder from the inflation valve, and thread the test fixture number 4 cylinder into the valve. Close the measuring device valve, and open all other valves. Allow the compartment to fill with air. Close the air feed valve, open the measuring device valve,

and read the pressure. Adjust the pressure until the pressure in the compartment is 2 psig.

NOTE: It may be necessary to wrap the oral inflation valve hose with masking tape or electrical tape to preclude leakage at the connection.

3. (All preserver compartments except the MK-2 outer compartments) Unlock the oral inflation valve and insert the rubber hose into the test fixture.

Tighten the hose clamps. Close the measuring device valve, and open all other valves. Allow the compartment to fill with air. Close the air feed valve, open the measuring device valve, and read the pressure. Adjust the pressure in the compartment until it reads 2 psig.

NOTE: Each test fixture is equipped with quick-disconnect fittings between each air feed valve and between the measuring device valve and the measuring device. To bleed air from an over inflated compartment, close all valves, disconnect the fitting between the air feed valves, and open the air feed valve nearest the compartment.

4. Allow 15 minutes for the preserver pressure to stabilize and then adjust the pressure.

5. Allow the preserver to remain undisturbed for 4 hours. Insure that the air feed valve is closed. Open the measuring device valve and record the pressure.

6. If the pressure in the compartment is below 1.60 psig, inflate the chamber to test pressure and coat it with a soap solution and locate the leaks. Mark the leak area.

Rinse the preserver with fresh water, air dry the assembly, and repair the leak. Retest and, if the repair is beyond the capability of maintenance, make the appropriate entry on the Inspection Check-Off Form.

7. Deflate the preserver.

Enter the appropriate information on the inspection record patch and History Card.

To clean the life preserver assembly, remove any survival items and other detachable item before cleaning and proceed as follows:

CAUTION: Solvents are not to be used in the cleaning process.

1. Prepare a solution of the approved cleaning compound consisting of one part compound and three parts water, when using the compound only.

2. When using the preferred cleaning agent, Knights Spray Nine Cleaner (commercially available), apply the solution to the soiled area with a spray or swab.

3. Allow the solution to remain on the surface for several minutes, then agitate with a soft brush or rag.

4. Rinse the surface thoroughly with water, then wipe with a cloth or sponge. Repeat this application until the surface is free from all solution.

5. Dry the raft with a lint free cloth and apply a light coating of talcum powder.

To install the CO_2 cartridges, proceed as follows:

NOTE: Weight of the cartridges will vary according to the manufacturer.

1. Weigh a charged cylinder and compare the stamped weight with the scale weight. Discard and replace the cartridge if the scale weight is more than 2 grams less than the stamped weight.

2. Place the lever on the valve in the closed position and screw the cartridge into the valve until it is fully seated. Remove the cartridge and examine the seal for damage. Replace both the cartridge and valve assembly if the seal is damaged.

3. Screw the cartridge into the valve until it is fully seated.

Safety wire the MK-2, MK-IV, or LPP-1 life preserver inflation assembly by passing a length of type S copper wire, 0.0159-inch diameter, through the hole in the inflation assembly body and through the hole in the lever. Twist the wire a minimum of four times and trim any excess, as shown in figure 14-10.

REPAIRS.–Patching of holes, tears, cuts, or punctures 1 inch square or less are the only repairs authorized on a life preserver. All cementing of life preservers will be performed as follows:

WARNING: Do not use toluene near open flame, heat, or electrical sparks. Avoid prolonged contact with the skin or breathing of fumes. Use only in a well ventilated area.

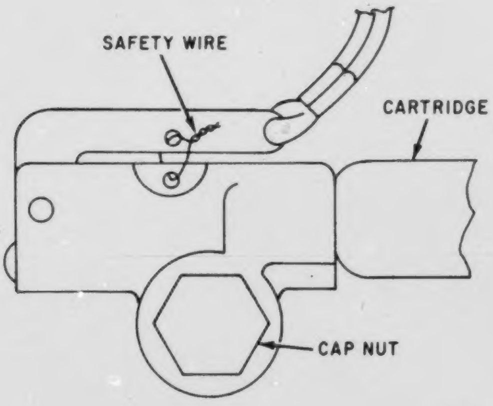

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Figure 14-10.—Life preserver inflation assembly safety wired.

NOTE: Do not touch a cleaned surface area when handling.

1. Clean both pieces to be cemented with four applications of toluene. Apply toluene with back-and-forth strokes on the first and third applications and one-way strokes on the second and fourth. Allow the areas to dry between applications.

2. Mix equal amounts of toluene and cement. Apply the mixture to the cleaned areas with a soft brush. Allow the area to dry approximately 10 minutes.

3. Apply a second coat of the mixture in the same way.

4. Apply two coats of unthinned cement to both pieces. Allow the first coat to dry for approximately 10 minutes.

5. When the second coat of unthinned cement has become tacky, place the pieces together. If the cemented area is a cut or tear, butt the edges of the damaged area together before applying the patch. Roll out any bubbles with a wooden roller.

6. Allow the cement to dry a minimum of 24 hours.

7. Dust the area with talcum powder.

To patch the life preserver, use life preserver cloth as required. Cut a rounded patch 1 inch larger than the damage on all sides. Center the patch over the damaged area and trace an outline of the patch on the preserver assembly fabric. This is done to facilitate cementing of the preserver fabric area. Cement the patch to the damaged area in accordance with the steps previously discussed.

Perform a leakage test and dust the area with talcum powder.

To perform any fabrication, assembly, or disassembly on life preservers, refer to NavAir 13-1-6.1.

PACKING PROCEDURES FOR THE LPA-1/1A.—To pack an LPA-1/1A life preserver, proceed as follows:

1. Insure that the preserver has been inspected in accordance with the procedures previously discussed.

NOTE: Prior to packing, insure that the preserver chambers are thoroughly evacuated.

2. Insert the collar snap hooks through the slots in the collar casing, and fold the collar lobe over to the slot in the collar casing assembly, as shown in step 2, figure 14-11. Insert the inflation lanyards through the slots in the casing assembly. Close the inflation assembly protective covers and insure that the oral inflation valves are locked.

3. Roll the sides and bottom of the collar lobe into the collar casing, and secure the casing by mating the hook and pile tape (step 3, fig. 14-11). Wrap the flotation snap hook and D-ring with pieces of rubber coated cloth. Secure the cloth with rubber bands in a loose fashion to facilitate prompt removal in an emergency situation.

4. Fold the body panels over to the top edge of the protective covers. (See step 4, fig. 14-11.)

5. Fold the body panels over to the inboard edge of the protective covers (step 5, fig. 14-11). Fold the body panels over to the bottom edge of the protective covers.

6. Insert an 8-inch piece of type I nylon cord through the retaining loop on the bottom of the casing flap (step 6, fig. 14-11). Insert the ends of the packing cord through the grommet in the top and inboard casing flaps. Pull the retaining loop up through the grommets.

NOTE: The nylon cord (packing cord) is used to aid in closing the preserver casing.

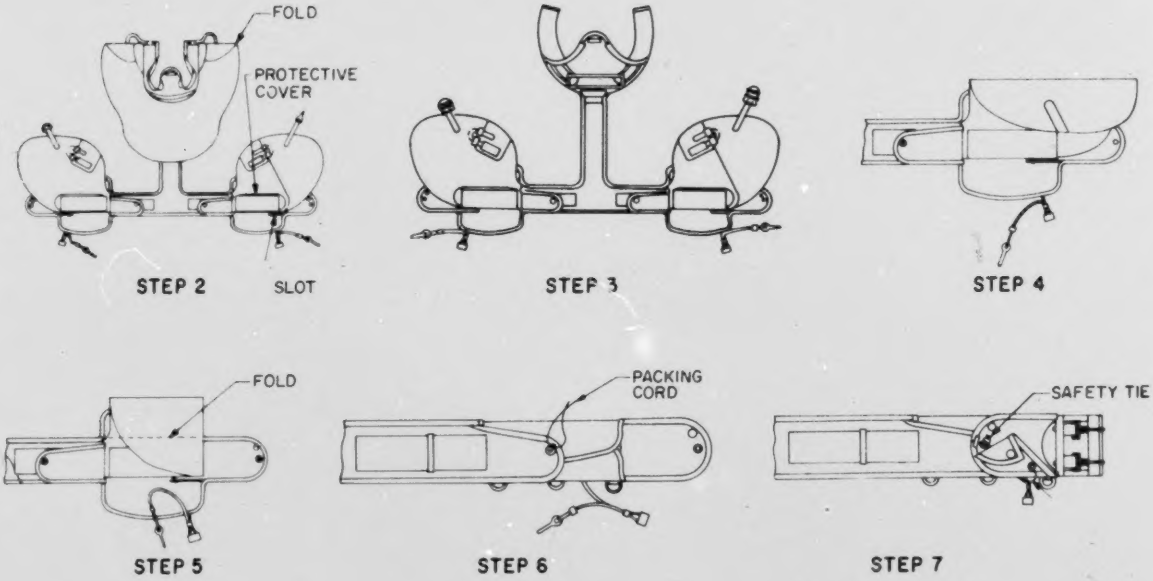

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Figure 14-11.–Packing procedures for the LPA-1/1A life preserver assembly.

7. Insert the nylon release pin through the channel in the outboard casing flap (step 7, fig. 14-11). Insert the packing cord through the grommet in the outboard casing flap and pull the retaining loop through the grommet. Insert the release pin through the retaining loop, into the pin keeper loop, and remove the packing cord. Safety tie the eye of the release pin to the retaining loop with one turn of size A nylon thread, single. Tie the ends with a surgeon's knot followed by a square knot. Safety tie the inflation lanyard at the toggle to the eyelet in the outboard casing flap with one turn of size E nylon thread, single. Tie the ends with a surgeon's knot followed by a square knot.

8. Insure that the survival items have been inspected for expiration and damage.

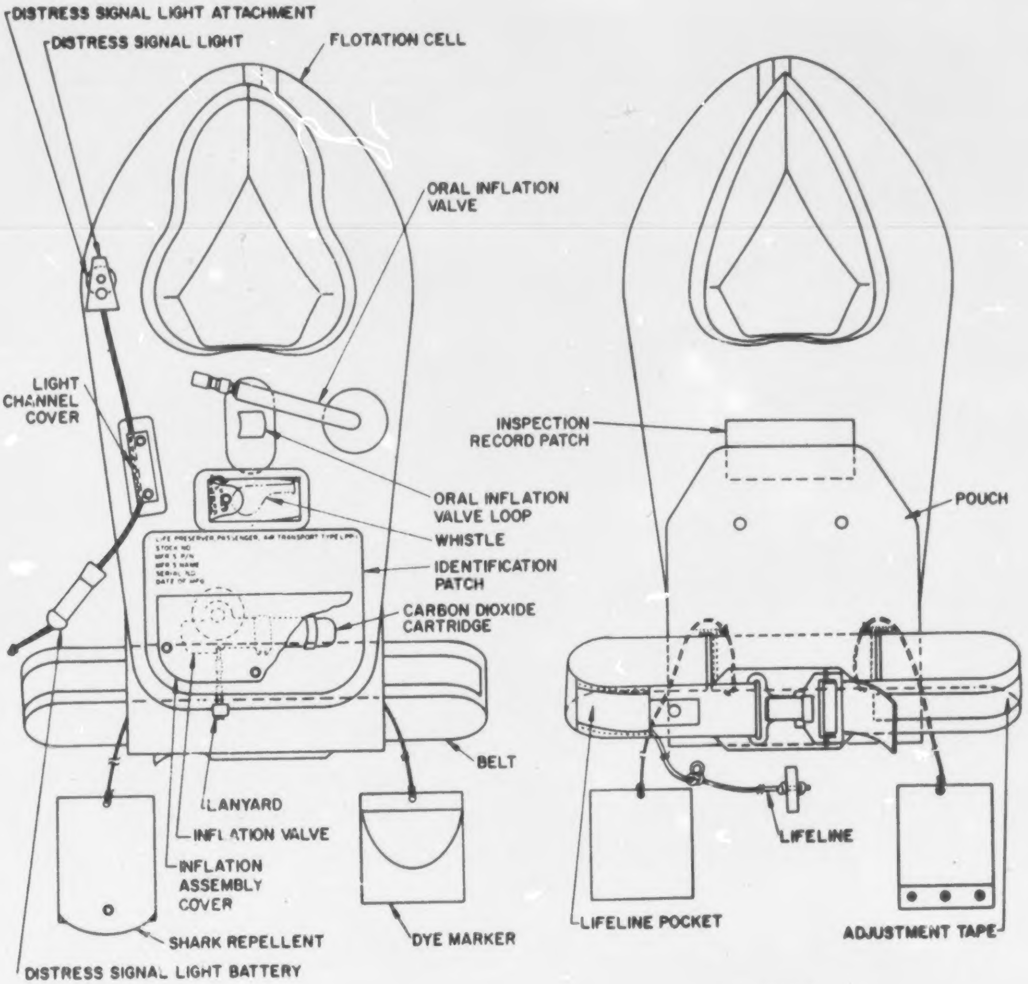
9. Insert two dye markers into the pouch labeled DYE MARKERS. Insert two Marine MK-13, Mod 0 Smoke and Illumination Signals into the pouch labeled FLARES.

Each survival item must be secured to the snap fastener tab of its respective pouch with a 36-inch length of nylon cord, type I. Sear each end of the cord.

LPP-1 Life Preserver Assembly

The LPP-1 life preserver, shown in figure 14-12, weighs 2.85 pounds and provides a minimum of 35 pounds buoyancy. The LPP-1 consists of a single compartment yoke type flotation assembly, a pouch and belt assembly, an inflation assembly, and a stowage container.

Components and survival items and quantity required to make up the LPP-1 life preserver


DISTRESS SIGNAL LIGHT ATTACHMENT
DISTRESS SIGNAL LIGHT
FLOTATION CELL
ORAL INFLATION VALVE
LIGHT CHANNEL COVER
ORAL INFLATION VALVE LOOP
WHISTLE
IDENTIFICATION PATCH
CARBON DIOXIDE CARTRIDGE
BELT
LANYARD
INFLATION VALVE
INFLATION ASSEMBLY COVER
SHARK REPELLENT
DYE MARKER
DISTRESS SIGNAL LIGHT BATTERY
INSPECTION RECORD PATCH
POUCH
LIFELINE
LIFELINE POCKET
ADJUSTMENT TAPE

FRONT

REAR

STORAGE CONTAINER

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Figure 14-12.—LPP-1 life preserver.

assembly are listed in table 14-2. All required components that are not supplied with the preserver must be individually requisitioned.

Table 14-2.–LPP-1 components and survival items.

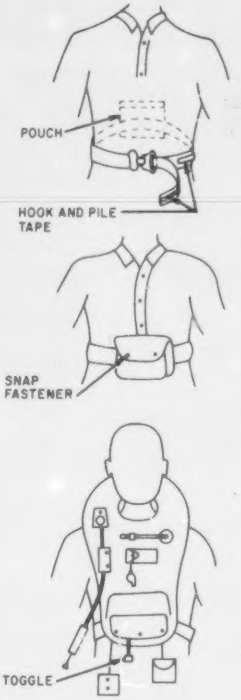
Component or survival item	Quantity required
Inflatable life preserver, LPP-1	1
Carbon dioxide cartridge, type I	1
Inflation valve (Saf-T-Pak)	1
Pouch and belt	1
Storage container	1
Whistle, type II	1
Distress signal light	1
Shark repellent	1
Dye marker	1

NOTE: Survival items are not used when the LPP-1 life preserver is modified for use with the small arms protective body armor.

The flotation assembly is constructed of chloroprene coated nylon cloth. It is equipped with an oral inflation valve, a valve stem, emergency signal light attachments, a whistle pocket, a belt loop, and an inspection record patch.

The pouch and belt assembly consists of a rubber coated nylon cloth pouch and an adjustable belt. The pouch contains the flotation assembly and survival items. The belt consists of a 53-inch piece of webbing, an adjustable buckle and clasp, a toggle assembly, and a toggle assembly pocket. The belt will adjust from a waist size of 30 to 52 inches and attaches the flotation assembly and pouch to the wearer by means of the belt loop on the flotation assembly and the slots in the back of the pouch. The toggle assembly consists of a wooden toggle and line and is used to secure survivors together while they are in the water. When not in use, the toggle line is wrapped around the wooden toggle and stowed in a pocket located on the belt.

The inflation assembly consists of a carbon dioxide cartridge and an inflation valve.



1. REMOVE PRESERVER FROM POUCH.
2. FASTEN BELT ADAPTERS IN FRONT WITH POUCH IN REAR.
3. ADJUST BELT TO SIZE. SECURE EXCESS BELT BY MATING HOOK AND PILE TAPE.
4. ROTATE POUCH TO FRONT AND READJUST BELT.
5. OPEN SNAP FASTENERS ON POUCH AND UNFOLD LIFE PRESERVER.
6. PLACE DEFLATED PRESERVER OVER HEAD.
7. LIFT LOWER END OF PRESERVER OUT OF POUCH.
8. INFLATE PRESERVER BY PULLING TOGGLE DOWN.

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Figure 14-13.–LPP-1 donning procedures.

The inflation assembly is connected to the valve stem on the front of the flotation assembly. The valve stem is equipped with a removable check which prevents leakage.

The storage container is used to store the preserver assembly when it is not in use. The storage container also has the donning instructions printed on it. The donning procedures are shown in figure 14-13.

The LPP-1 is manually inflated by pulling the inflation assembly lanyard down. In an emergency situation, the oral inflation valve should be used to top-off an inflated preserver, to maintain inflation of a leaky preserver, or to inflate a preserver when the inflation assembly malfunctions or fails. The oral inflation valve is also used to inflate a preserver with air during an inspection test or to deflate a preserver in preparation for packing.

NOTE: The pouch must be opened and the flotation assembly unrolled prior to inflation through the oral inflation valve or the inflation assembly. This does not apply to the LPP-1's modified for use by combatant helicopter aircrewmen.

Upon the availability of the LPP-1, the use of all other life preservers by personnel authorized to wear the LPP-1 will be discontinued, except as follows: Noncombat configured passengers whose total clothing and equipment weight does not exceed 15 pounds and who are not carrying any high density items such as weapons or other similar metallic items are authorized continued use of the MK-2 life preserver, with an attritional basis method for replacement with the LPP-1.

To pack the LPP-1 life preserver assembly for noncombatant personnel, proceed as follows:

1. Insure that the preserver, pouch, and storage container have been inspected in accordance with the procedures previously discussed in this chapter under the heading of Inspection and Maintenance.
2. Insure that the survival items have been inspected for expiration and damage.
3. Insure that the belt is inserted through the retaining patch on the rear of the preserver.
4. Lay the preserver out on a clean surface with the inflation assembly facing up.
5. Insert the ends of the belt through the slots in the pouch.
6. Insure that each survival item is properly stowed or attached. (See fig. 14-12.)

The dye marker and shark repellent are tied to the belt with a 12- to 15-inch length of type I nylon cord. Use bowline knots to form the ties.

7. Position the dye marker and shark repellent in the bottom of the pouch. Lock the oral inflation valve.
8. Fold the flotation tube over to the width of the pouch.
9. Roll the flotation tube into the pouch and close pouch.
10. Insert the packed preserver into the storage container.
11. Tie the storage container to the preserver pouch.

To pack an LPP-1 life preserver for combatant personnel, proceed as follows:

1. Insure that the preserver, belt, and protective cover have been inspected.
2. Insure that the belt is inserted through the retaining patch on the rear of the preserver. Close the inflation assembly protective cover.
3. Tuck the protective cover back panel through the preserver neck opening.
4. Insert the oral inflation valve through the oral tube patch. Insert the oral inflation valve loop through the loop reinforcing patch. Stow the oral inflation valve in the loop. Insure that the oral inflation valve is locked.
5. Mate the hook and pile tapes.

MK-2 Life Preserver Assembly

The MK-2 life preserver assembly weighs 3 pounds and provides a minimum of 20 pounds of buoyancy. The MK-2 is a vest type preserver and consists of a three-compartment flotation assembly, a harness and waist strap assembly, and two inflation assemblies.

Components and survival items and quantity required to make up the MK-2 life preserver assembly are listed in table 14-3. All required components that are not supplied with the preserver must be individually requisitioned.

Table 14-3.–MK-2 components and survival items.

Component or survival item	Quantity required
Inflatable life preserver vest, MK-2	1
Carbon dioxide cartridge, type I	2
Inflation valve	2
Distress signal light	1
Signal, Smoke and Illumination, Marine MK-13 Mod 0	2
Dye marker	2
Shark repellent	1
Whistle, type II	1

The flotation assembly is constructed of chloroprene coated nylon cloth and forms three compartments of the same size and shape. The outboard compartment is serviced by the right inflation assembly, the center compartment is

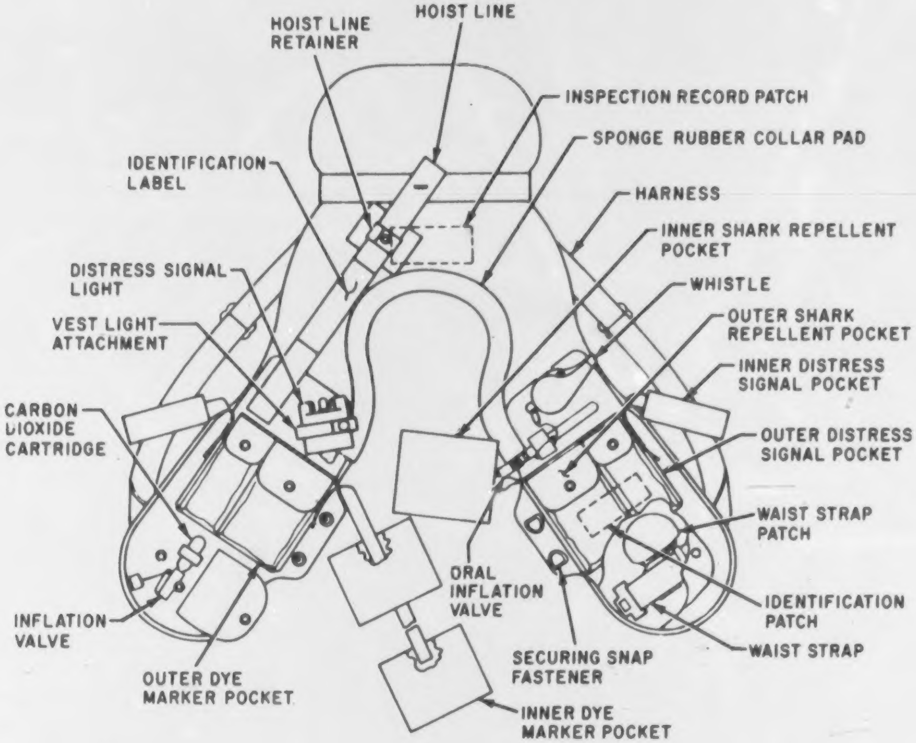
HOIST LINE RETAINER
HOIST LINE
INSPECTION RECORD PATCH
SPONGE RUBBER COLLAR PAD
IDENTIFICATION LABEL
HARNESS
INNER SHARK REPELLENT POCKET
DISTRESS SIGNAL LIGHT
WHISTLE
VEST LIGHT ATTACHMENT
OUTER SHARK REPELLENT POCKET
INNER DISTRESS SIGNAL POCKET
CARBON DIOXIDE CARTRIDGE
OUTER DISTRESS SIGNAL POCKET
WAIST STRAP PATCH
ORAL INFLATION VALVE
IDENTIFICATION PATCH
INFLATION VALVE
WAIST STRAP
SECURING SNAP FASTENER
OUTER DYE MARKER POCKET
INNER DYE MARKER POCKET

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Figure 14-14.–MK-2 life preserver assembly.

serviced by the oral inflation valve, and the inboard compartment is serviced by the left inflation assembly. The flotation assembly is equipped with four outer and five inner survival equipment pockets, a whistle and distress light attachment, two securing snap fasteners, a webbing hoist line, two inflation assembly covers, and two valve stems. (See fig. 14-14.)

The harness and waist strap assembly is attached to the inboard side of the flotation assembly and adjusts to fit the wearer. One end of the hoist line is attached to the harness strap above the preserver collar pad.

Each inflation assembly is made up of a carbon dioxide cartridge and an inflation valve. Each inflation assembly is connected to a valve stem on each side of the preserver.

The MK-2 is manually inflated by pulling both inflation assembly lanyards down at the same time. It is not designed for inflation through the oral inflation valve. In an emergency situation, the center compartment may be inflated through the oral inflation valve to increase the buoyancy of the preserver.

The MK-2 is a vest type life preserver and is not folded or packed in a carrying case. To pack a MK-2, proceed as follows:

1. Insure that the preserver has been inspected in accordance with the procedures discussed previously in this chapter, under the heading of Inspection and Maintenance.

2. Remove the carbon dioxide cartridges, and wrap one layer of electrical tape around each

cartridge. Do not tape the cartridge threads. Reinstall the cartridges.

NOTE: Other cloth based, pressure sensitive tapes may be used.

3. Close the inflation assembly protective covers. Insure that the oral inflation valve is NOT locked.

4. Insure that the survival items have been inspected for expiration and damage.

5. Stow the survival items as shown in figure 14-14.

MK-3C Life Preserver Assembly

The MK-3C life preserver assembly weighs 3 pounds and provides a minimum of 60 pounds of buoyancy. The MK-3C assembly consists of two single compartment flotation cells, a carrying case assembly, two inflation assemblies, and survival items.

Each flotation cell is constructed of chloroprene coated nylon cloth and is equipped with a valve stem and oral inflation valve. The flotation cells are attached to each other by means of cloth gussets. A D-ring is attached to the gusset on the right and a snaphook is attached to the gusset on the left. These attachments are used to secure the preserver assembly around the wearer's waist. An inspection record patch is also provided on the back of the top flotation cell.

The carrying case is constructed of nylon cloth; it protects the flotation assembly and provides for attachment of the preserver assembly to the wearer's flight clothing.

The carrying case assembly is made up of a left casing, a right casing, an adjustment envelope, a slide strap, a carrying case D-ring, and a carrying case snaphook. The left and right casings are secured by nondirectional snap fasteners and nylon retaining pins attached to the inflation assembly lanyards. The adjustment envelope is secured by hook and pile tape fasteners. The right and left casings and the adjustment envelope are connected by means of the slide strap which is also used to adjust the preserver waist size. The D-ring, attached to the left casing, and the snaphook, attached to the right casing, are used to secure the carrying case around the wearer's waist.

Each inflation assembly is made up of a carbon dioxide cartridge and an inflation valve. Each inflation assembly is connected to the valve stem attached to each flotation cell. The valve stems are equipped with removable checks which prevent leakage. When installed, the inflation assemblies are covered with anti-chafe covers.

The MK-3C is manually inflated by pulling both inflation assembly lanyards down and forward at the same time. The lanyards remove the nylon retaining pins securing the right and left casing flaps and operate the inflation valves. The snap fasteners securing the casings and the hook and pile tape securing the adjustment envelope will then release as the flotation cells inflate.

The MK-3C is not designed for inflation through the oral inflation valves. In an emergency situation, the oral inflation valves should be used to top-off an inflated preserver, maintain inflation of a leaky preserver, or inflate a compartment if an inflation assembly malfunctions or fails. However, the oral inflation valves are used to inflate a preserver with air during an inspection test or to deflate a preserver for packing.

NOTE: The carrying case must be opened and the flotation assembly unfolded prior to inflating a preserver through the oral inflation valves.

To pack a MK-3C life preserver, proceed as follows:

1. Insure that the preserver and carrying case have been inspected.

2. Insure that the survival items have been inspected for expiration and damage.

3. Open the adjustment envelope and accordion fold the rear section of the flotation cells to the width of the center section of the envelope.

4. Insert the folded cells into the envelope and close the envelope by mating the hook and pile tapes.

5. Insert one Marine Smoke and Illumination Signal, MK-13, Mod 0, in each distress signal pocket.

6. Attach the dye marker and shark repellent to the flotation cell retaining loops.

NOTE: Both sides of the carrying case must be packed in accordance with the steps listed above.

7. Close the inflation assembly protective cover, and secure the inflation assembly strap around the protective cover. Insure that the oral inflation valves are locked. Do not fold or bend the oral inflation valves.

8. Fold the flotation cells over so that the distress signal pocket is exposed.

9. Fold the flotation cells along the inboard edge of the distress signal pocket, and route the snap or D-ring over the top of the pocket.

10. Secure the casing snap fasteners or hook and pile tape, as applicable. Insert a packing cord (8-inch length of type I nylon cord) through the retaining loop on the inboard casing flap.

11. Insert the nylon release pin between the lanyard flap and the outboard carrying case flap. Insert the packing cord through the grommet in the lower, upper, and outboard carrying case flaps, and pull the retaining loop up through the grommets. Insert the release pin through the retaining loop, and remove the packing cord from the loop. Safety tie the eye of the release pin to the retaining loop with one turn of size A nylon thread, single. Tie the ends with a surgeon's knot followed by a square knot.

12. Snap the lanyard flaps closed.

LPA-2 Life Preserver Assembly

The LPA-2 life preserver assembly weighs 4 pounds (without survival items) and provides a maximum of 65 pounds of buoyancy. It is designed as a constant wear item for use with the Survival Vest and will not interfere with the removal of the nonintegrated parachute harness. The LPA-2 life preserver assembly consists of a two chambered flotation assembly, two CO_2 inflation assemblies, and optional survival items and pouches. The survival item pouches are attached to the casing assembly with snaphooks. The dye marker and signal flares are not initially supplied with the preservers and must be individually requisitioned.

NOTE: New LPA-2 life preserver assemblies received from supply must be tested and repacked in accordance with information contained in this chapter prior to placing the preservers in service.

The flotation assembly is constructed of polychloroprene coated nylon cloth and consists of two independent flotation chambers.

One chamber consists of the left waist lobe joined by a tube to the right collar lobe. This chamber is serviced by the CO_2 inflation assembly and oral inflation valve attached to the left waist lobe. The other chamber consists of the right waist lobe joined by a tube to the left collar lobe. This chamber is serviced by the CO_2 inflation assembly and oral inflation valve attached to the right waist lobe. These two chambers are sewn together at the collar lobes.

Each waist lobe of the flotation assembly is equipped with an attachment patch used for securing the casing assembly by means of rivets. In addition, the right waist lobe is equipped with a snaphook and the left waist lobe is equipped with a D-ring. The snaphook and the D-ring are used to secure the waist lobes together after inflation.

Each collar lobe of the inflation assembly is equipped with a snaphook for attachment of the Survival Vest D-rings (parachute risers are routed outside of the collar lobes). In addition, each collar lobe is equipped with a foam cushion strip to provide for the wearer's neck comfort after inflation. An inspection record patch is also provided on a collar lobe.

The casing assembly is constructed of rubber coated nylon cloth and protects the flotation assembly. The casing assembly also provides for size adjustment and attachment to the wearer. The casing assembly consists of the adjustable casing, an adjustable webbing belt, belt keepers and D-rings, and the front connector assembly. The LPA-2 life preserver assembly is shown in figure 14-15.

The webbing belt, attached to the inside waist portion of the casing assembly, provides for waist size adjustment from 30 to 44 inches. The webbing belt keeper loops retain the webbing belt and provide for adjustment of the survival vest about the wearer's waist. In addition, there are 6 D-rings secured to the webbing belt keeper loops, used for attachment of the survival item pouches, a raft retaining line, and other accessories.

Hook and pile tapes, attached to the outside waist portion of the casing, are used for slack adjustment. In addition, hook and pile tapes, attached about the periphery of the collar casing and the lower edge of the back portion of the casing are used to enclose the casing assembly

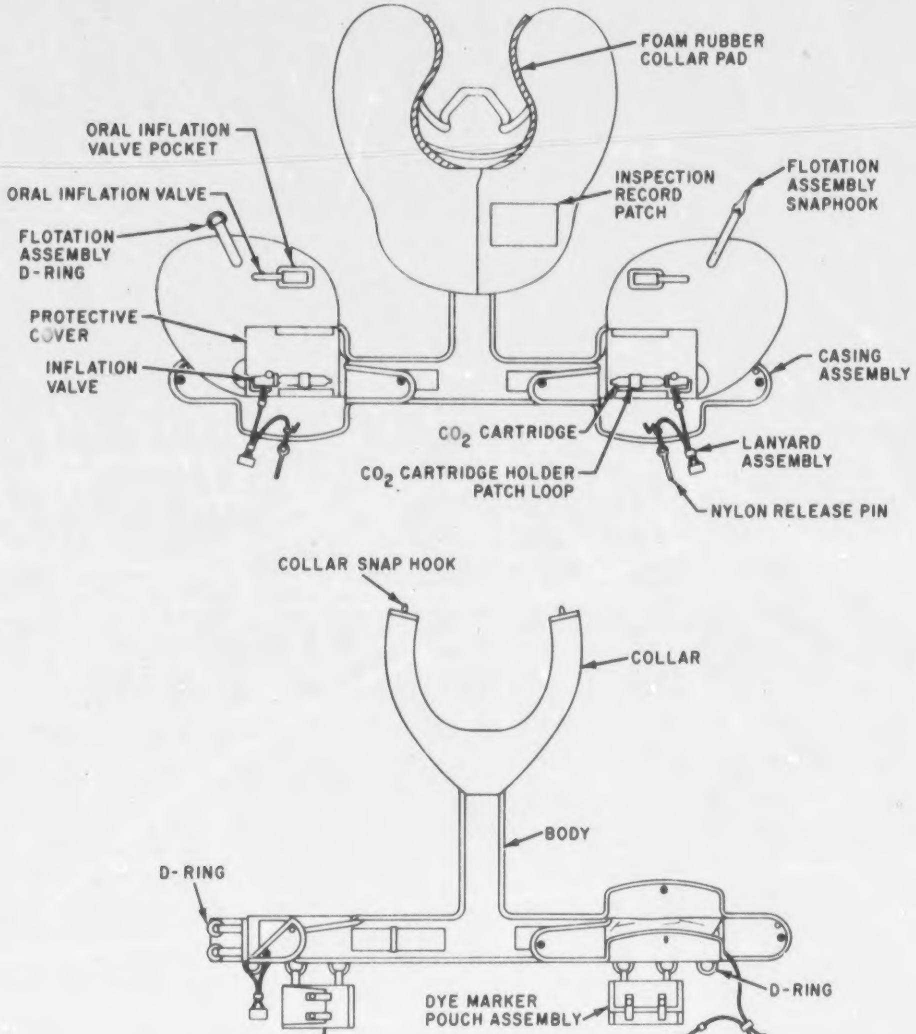
FOAM RUBBER COLLAR PAD
ORAL INFLATION VALVE POCKET
ORAL INFLATION VALVE
FLOTATION ASSEMBLY D-RING
INSPECTION RECORD PATCH
FLOTATION ASSEMBLY SNAPHOOK
PROTECTIVE COVER
INFLATION VALVE
CASING ASSEMBLY
CO2 CARTRIDGE
LANYARD ASSEMBLY
CO2 CARTRIDGE HOLDER PATCH LOOP
NYLON RELEASE PIN
COLLAR SNAP HOOK
COLLAR
BODY
D-RING
D-RING
DYE MARKER POUCH ASSEMBLY
FLARE POUCH ASSEMBLY
TOGGLE
RELEASE PIN

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Figure 14-15.—LPA-2 life preserver assembly.

about the flotation assembly. The casing assembly is secured around the wearer's waist by the front connector assembly, which consists of two snaphooks and two D-rings backed by webbing pads for comfort.

Each inflation assembly is made up of a carbon dioxide cartridge and an inflation valve. Each inflation assembly is connected to a valve stem attached to each waist lobe (each stem is equipped with a replaceable check). In addition, a lanyard with a pull toggle and a casing flap retaining pin are connected to each inflation assembly.

The LPA-2 is manually inflated by pulling both inflation assembly pull toggles down and forward. This action removes the retaining pins securing the casing assembly about the waist lobes and actuates the inflation assemblies. The hook and pile tapes, securing the casing assembly about the collar lobes, will separate as the preserver inflates.

NOTE: The casing must be manually opened and the flotation assembly unfolded prior to inflating a preserver through the oral inflation valve.

The LPA-2 is not primarily designed for inflation through the oral inflation valves. In an emergency situation, the oral inflation valves should be used to top off an inflated preserver, maintain inflation of a leaky preserver or inflate a chamber if an inflation assembly malfunctions. However, the oral inflation valves are used to inflate a preserver during an inspection test or to evacuate a preserver in preparation for packing.

The LPA-2 life preserver assembly is authorized for use by all aircrew personnel wearing compatible flight clothing. As the LPA series life preserver assemblies become available, they will replace the MK-2 and MK-3C assemblies. Replaced MK-2 and MK-3C life preserver assemblies should be returned to supply.

To pack an LPA-2 life preserver assembly, proceed as follows:

NOTE: Insure that the LPA-2 has been inspected in accordance with the procedures discussed previously in this chapter, under the heading of Inspection and Maintenance. Prior to packing, insure that the chambers are thoroughly evacuated. Also, insure that the carbon dioxide cylinders are charged.

1. Lock the oral inflation valve by the knurled ring and place it in the oral valve pocket. Position the LPA-2 with the collar panel folded down.
2. Insert the collar snaphooks through the slots in the collar casing and fold the collar edge over to the slots in the casing.
3. Fold the edges of the collar panels over.
4. Accordion fold the sides of the collar lobes into the collar casing, tuck in the casing lip, and secure the collar casing with the hook and pile tape.
5. Wrap the snaphook and D-ring with a piece of scrap fabric. Secure the fabric with rubber bands in a loose fashion to facilitate prompt removal in an emergency situation. Close the protector cover around the inflation assembly and secure it with hook and pile tape.
6. Fold the waist lobes over the top edge of the protective covers.
7. Fold the waist lobes over to the outboard edge of the antichafing patch.
8. Fold the waist lobes over to the bottom edge of the protective covers.
9. Fold the bottom casing flap containing the retaining loop up. Insert an 8-inch length of Type I nylon cord through the retaining loop.
10. Pass the ends of the packing cord through the grommet located in the top casing flap. Pull the retaining loop through the grommet.
11. Fold the inboard casing flap over, passing the packing cord through the grommet. Pull the retaining loop through.
12. Route the nylon release pin through the channel in the outboard casing flap.
13. Fold the outboard casing flap over, passing the packing cord through the grommet. Pull the retaining loop through the grommets. Insert the release pin through the retaining loop and into the pin keeper loop. Remove the packing cord.
14. Safety tie the eye of the release pin to the retaining loop with one turn of size A, single nylon thread.

Tie the ends with a surgeon's knot followed by a square knot. Safety tie the inflation lanyard at the toggle to the eyelet in the outboard casing flap with one turn of size E single nylon thread. Tie the ends with a surgeon's knot followed by a square knot.

15. Close the pin protector flaps.

NOTE: Each survival item is secured to the snap fastener tab of its respective pouch with a 36-inch length of nylon cord Type I. Sear the ends of each cord to prevent fraying.

16. Insure that the survival items have been inspected for expiration and damage. Insert the two dye markers into the pouches labeled DYE MARKER. Insert the two Marine MK-13, Mod 0 smoke and illumination signals into the pouches labeled FLARES. Attach the flare pouch assembly and the dye marker pouch assembly to the casing assembly.

CHAPTER 15

LIFERAFTS AND EQUIPMENT

Naval aircraft making operational flights over water are required to carry rafts which will accommodate all the assigned crew plus passengers. These rafts are manufactured in various sizes and configurations to meet the demands of all types of aircraft.

Pneumatic rafts are compact assemblies, capable of being stowed in a small area. They should be stowed so as to be readily accessible, preferably near an emergency exit. Never stow a raft under other equipment or cargo or near batteries. Protect them from heaters, engines, auxiliary power units, electronic tubes, and other sources of heat.

If the aircraft flight manual designates a storage place for rafts, this space should be used, unless otherwise directed by competent authority. Whenever possible, rafts should be stowed in the same place in all aircraft of the same model. This will enable the crewmen to become familiar with their location and thus avoid confusion in the event of a ditching. Rafts are constructed of various types of rubberized, rubber coated, rubber impregnated, or plain nylon cloth.

Materials and components used in the construction of liferafts should conform to the applicable specifications and drawings as listed or required in MIL-L-5567D. Materials and components which are not covered by the applicable specifications or drawings or are not specifically described therein must be of the best quality, of the lightest practicable weight, and entirely suitable for the purpose intended.

Liferafts are susceptible to damage from maltreatment. However, they are surprisingly strong and durable, and have a tenacious stability when afloat at sea.

It is the responsibility of the PR to inspect, pack, and maintain all of the various types of rafts and related equipment.

MULTIPLACE RAFTS

Multiplace liferafts vary in size and in the quantity of equipment they carry.

CNO has established survival equipment lists as standards to be utilized by all concerned. These lists provide the equipment necessary for an effective 24 hour survival capability.

Multiplace liferafts are assigned a MARK number; this number refers to the number of personnel that the raft is designed to adequately support. For example, a MK-7 raft is equipped with the necessary survival gear and provides sufficient buoyancy to keep seven people afloat for the duration of the survival capability.

CONSTRUCTION

The body of the liferaft consists of an encircling buoyant tube and a fabric bottom. The fabric sections used in the inflatable buoyant tube are incorporated in such a manner that the warp threads of the straight fabric run in a circumferential direction around the tube and the warp threads of the bias cloth run in the opposite direction in the adjoining sections.

The fabric bottom of the raft is applied without tension across the enclosure formed by the flotation tube and is attached securely to the underside.

Seam Tapes And Patches

All raft seams and patches are secured by the use of self-curing cement, applicable to the specifications listed in the Inflatable Survival Equipment Manual, NavAir 13-1-6.1.

No sewing or stitches are used in the seams or through the fabric of any compartment. However, sewing is permitted in the construction of patches, oarlocks, disks, flap seats, cylinder carriers, lifeline supports, handles, and pockets.

Seam repair is done only if a flotation tube does not leak; that is, if only the outer seam tape is loose, or if the seam does not seal a flotation tube. If the seam tape is present and undamaged, recement the tape to the raft. If the tape is missing, measure and fit a replacement tape to the area, and cement it in place. Overlap the seam tape on other seams a minimum of 1 inch.

If the tape is damaged, peel the tape from the raft. Apply toluene only as needed to loosen the tape. Avoid excessive application of toluene on the seams and remove any spilled or excess toluene immediately.

NOTE: Do not use toluene near open flame, heat, or electrical sparks. Avoid prolonged contact with the skin or breathing of fumes. Use toluene only in well ventilated areas.

Do not touch the cleaned raft areas when handling. Clean both the pieces to be cemented with four applications of toluene. Apply the toluene with back-and-forth strokes on the first and third applications and one-way strokes on the second and fourth. Allow the areas to dry between applications.

Mix equal amounts of toluene and cement, applying the mixture to the cleaned areas with a soft brush. Allow the areas to dry approximately 10 minutes. Apply a second coat of the mixture in the same way.

Apply two coats of unthinned cement to both pieces, allowing the first coat to dry for approximately 10 minutes.

When the second coat of unthinned cement becomes tacky, place the pieces together. If the cemented area is a cut or tear, butt the edges of the damaged area before applying a patch. Roll out the bubbles using a wooden roller.

Allow the cemented area to dry a minimum of 24 hours and then dust the area with talcum powder.

If the seam tape is only damaged, trim the old tape and replace it with new tape. Overlap the other seam tape a minimum of one inch. All tapes and patches are applied to the liferaft without tension. The tape is applied in such a way that an equal amount of tape width is on each side of the seam edge which it covers.

To patch a damaged area on a liferaft, select the applicable color and type of raft cloth, depending on the type of raft to be repaired. Cut a rounded patch 1 inch larger than the damaged area on all sides. Scallop the edges of the patch if it is larger than 5 inches in diameter.

If the damage area is larger than 1 inch, patches must be applied to both sides. Intermediate maintenance activities have the prerogative to declare rafts beyond the capability of maintenance if internal patching is required. Center the patch over the damaged area and trace an outline of the patch on the raft fabric.

Cement the patch to the damaged area in accordance with the instructions previously discussed in this section. After all repairs have been made, perform a leakage test on the raft and dust the repaired area with talcum powder.

Bulkheads

The flotation tube is separated into two compartments by internal vertical bulkheads. Bulkheads are constructed of laminated cloth and are of a six gore hemispherical design. The bulkheads are installed amidships, equidistant from the bow and stern, in such a way that the volume of the two compartments is equal. A 4-inch diameter patch of laminated cloth is securely cemented to each side of the bulkhead, at the manifold, in such a location that the bulkhead is protected against abrasion by the manifold diffusers when the raft is packed in the carrying case.

Inflatable Seats

An inflatable seat is installed in certain multiplace liferafts; for example, the MK-4, MK-7 and MK-12A-1. These seats are circular in shape and are constructed of laminated cloth.

The ends of the seat are tailored to fit the curvature of the flotation tube. The inflatable seat is an independent air chamber and manually inflated through the topping off valve by using the hand pump provided.

The inflatable seat is attached to the bottom of the raft with V-shaped hinge tapes made of laminated cloth. This method of attachment allows for expansion, and prevents undue stresses between the bottom of the raft and the seat.

Supply Pocket

Each MK-4, MK-7, and MK-12A-1 liferaft contains a supply pocket which measures approximately 8 x 8 x 2 inches. The pocket is attached to the starboard side of the flotation tube surface inside the raft by stitching the pocket to a patch and cementing the patch to the tube. Using black wash-proof ink, insure that each pocket is clearly marked SUPPLY POCKET in 1/2-inch letters on the MK-4 and MK-7 rafts. The lettering should be 1 inch high on the MK-12A-1 supply pocket.

In addition to the starboard supply pocket, the MK-12A-1 raft has a port supply pocket. This pocket is attached to the raft in the same manner as previously discussed. The lettering height on the port pocket is 1 inch for the first line and 1/4 inch for all other lines.

Combination Supply Pocket And Bailer

Each liferaft except the MK-20 contains one detachable combination supply pocket and bailer. The pocket is closed by means of a slide fastener across the top, which is sealed with tape after the equipment is packed. A loop of spring wire is contained in the seam around the slide fastener so that the pocket may be fashioned into a bailing container. One end of a 5-foot length of type III nylon suspension line is secured to the slide fastener wire stirrup pull; the other end is attached to the nearest life line patch loop.

The words SUPPLIES AND BAILER are stenciled in 1/2-inch letters on the pocket. Below this, stenciled in 1/4-inch letters, are the pocket contents.

Lifeline

A lifeline of natural color nylon rope, 1/4-inch diameter, encircles the outboard perimeter of the raft. The lifeline is attached to each lifeline patch loop with an overhand knot tied on the inner side of each patch loop so as to prevent the line from running free through the loops. Four inches of slack is allowed in the line between the lifeline patch loops. Each completed lifeline patch can withstand a 250 pound pull exerted in a direction perpendicular to the base of the patch.

The lifeline provides a means for securing the accessory containers to the liferaft by using a 10-foot length of type III nylon cord.

The MK-20 liferaft contains an inner lifeline that provides for the safety and survival of aircrewmen.

Righting Handles

Righting handles are provided on all liferafts except the MK-20. These handles provide a means of righting a capsized raft.

Topping-Off Valves

Topping-off valves are installed on each flotation tube, inflatable seat, each section of inflatable floors, and each side of the floor supports. The required number of topping-off valves and their location on the rafts will vary depending on the type of raft concerned.

Topping-off valves are used for manual inflation purposes in conjunction with the hand pump. The valve also serves as a means for relieving high internal tube pressure that may possibly build up during hot, sunny days.

Two topping-off valves are installed on the same side of the raft main flotation tube, one on each side of the internal bulkhead, above the inside horizontal centerline of the tube, 4 inches from the point of attachment of the vertical internal bulkhead.

Stenciled instructions relative to topping-off and deflation of the raft are applied on the raft flotation tube adjacent to the topping-off valves. Appearing in 1/4-inch wash-proof black ink letters, the instructions are stenciled on a white rubber patch as follows:

> TO INFLATE COMPARTMENTS MANUALLY: Attach hand pump to valve cap, unscrew cap 1 1/2 turns to the right and then pump to inflate. When desired pressure is attained, retighten valve cap and remove pump.
> TO DECREASE PRESSURE: Open valve 1 1/2 turns to the right and bleed.

Inflation System

The valve of the CO_2 cylinder is threaded into the coupling nut of the manifold. Since multiplace liferafts are constructed with internal bulkheads, the purpose of the manifold is to provide a common means of directing and diffusing the flow of carbon dioxide entering the raft inflatable tube chamber. The manifold outlets must bridge the internal bulkhead over which they are mounted. Figure 15-1 illustrates the operation of the raft CO_2 inflation system manifold.

All of the exposed metal surfaces of the inflation system which might chafe the raft fabric while in a packed condition must be covered with several layers of rubber coated cloth, and secured with cloth based, pressure sensitive tape.

Due to space limitation, this chapter cannot possibly contain all of the available information concerning liferafts. The Inflatable Survival Equipment Manual, NavAir 13-1-6.1, is referenced for more detailed information.

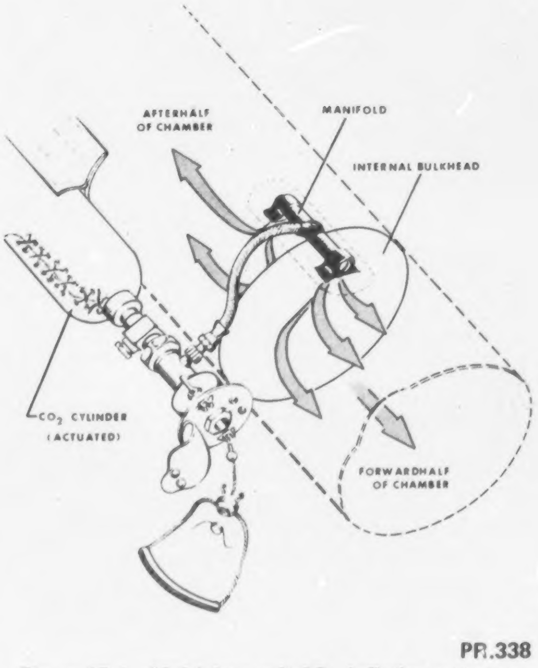

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Figure 15-1.—Multiplace raft CO_2 inflation system manifold operation.

Inflatable Survival Equipment Records

The records used by the Aircrew Survival Equipmentman to provide a systematic means of control consists of various documents. Inspection check-off forms, history cards, and shop process cards are discussed in the following paragraphs.

INSPECTION CHECKOFF FORMS.—An inspection checkoff form provides for the logical sequence of inspection and maintenance of inflatable survival equipment. Additionally, it provides for the notation of raft disposition and for remarks that are relative to the raft.

As each task is completed a checkmark is placed in the corresponding "OK" or "DISCREPANCY FOUND" box as applicable. If a task is not applicable, then the corresponding "N/A" box is checked. When a discrepancy that is related to an inspection task is corrected, the appropriate "DISCREPANCY CORRECTED" box is checked. The Collateral Duty Inspector must sign the checkoff form next to the inspector's name. After the inspection, the Inspection Checkoff Form is forwarded to the custodian of the History Card and filed with the History Card.

Disposition of the equipment is indicated by checking either the "Ready For Issue" or "Beyond Capability of Maintenance" block. If beyond the capability of maintenance, the appropriate "action taken" code must be entered in the "Code" space. For a description of action taken codes, refer to the Naval Aviation Maintenance Program Manual, Appendix G, OpNav 4790.2 (Series), and the Work Unit Code Manuals.

The remarks section of the form should denote any discrepancy found in the inspection and, if applicable, the notation that the condition was corrected.

HISTORY CARD.—The history card for inflatable survival equipment contains information pertinent to a particular assembly of inflatable survival equipment. In addition to the information required on the card, the inspection cycle interval must be entered in the upper, left hand corner of the card face. The history card is a permanent record and when completed, it should be affixed to a new card. If an assembly is transferred to another activity, the history card must accompany the assembly.

SHOP PROCESS CARD.–The shop process card contains minimal shop maintenance procedures. Clearances, tolerances, diagrams, and equipment required to perform the maintenance procedures is included. Shop process cards are arranged in a logical sequence to aid the Aircrew Survival Equipmentman.

LIFERAFT INSPECTION

All liferaft assemblies must be subjected to a calendar inspection upon original issue and at intervals which coincide with the aircraft inspection cycle. However, the interval between calendar inspections cannot exceed 34 weeks for assemblies with H-46 aircraft applications and 30 weeks for all other aircraft applications.

The functional test is performed upon issue and every fourth inspection thereafter. On multiplace rafts only, the CO_2 inflation cylinder hydrostatic pressure test must be performed at least once every 5 years. However, charged cylinders are considered serviceable regardless of the last hydrostatic test date. The leakage test and all other inspection tasks are performed upon issue and every inspection cycle thereafter.

The procedures for liferaft inspection detailed in the following paragraphs present a logical sequence for a proper inspection. It should be noted that not all of the inspection steps will be included in this chapter (space limitations). However, some of the more critical areas will be discussed. For a detailed coverage concerning liferaft inspection, refer to NavAir 13-1-6.1.

The calendar/special inspection consists of the following major tasks (to be performed in the order listed):

1. Preliminary procedures.
2. Functional inspection (if required).
3. Visual inspection.
4. Leakage test.
5. Records updating
6. Repacking.

To perform the preliminary procedures, inspect the container and/or case for fabric cuts, tears, and seams for proper adhesion or stitching. Inspect the straps and handles for security and wear. Inspect all other assembly parts for wear, damage, and security.

Inspect all hardware for security of attachment, corrosion, damage, wear, and, if applicable, ease of operation. The CDI must inspect condition of the container and/or case exterior for contamination and wear. If any discrepancies are found, the container/case should be locally repaired or removed from service and replaced, as deemed appropriate by the inspecting activity.

For proper screening, the liferaft and associated components should be laid out in a clean area free of foreign objects. Inspect the raft for obvious defects such as cuts, tears, ruptured seams, damaged equalizer tube, and manifolds. If the screening indicates damage which is beyond the capability of maintenance, the appropriate entry should be made on the inspection checkoff form and the entire assembly forwarded to supply.

DETERMINATION OF REPAIRABILITY

Inflatable survival equipment is considered beyond repair for any of the reasons listed below:

1. Porous fabric area on the inflation tubes.
2. Split or open tube seams.
3. Leakage test failure resulting from other than a cut, tear, or puncture.
4. Extensively damaged floor.
5. (All rafts except MK-20) Damaged, malfunctioning, excessively worn, or corroded inlet valve, manifold, oral inflation valve, or oral inflation tube, as applicable.
6. Damaged, malfunctioning or excessively corroded topping-off valve that cannot be corrected by replacement of the topping-off valve opening insert.
7. (Multiplace rafts only) Leaky internal bulkheads.

To perform a functional inspection, proceed as follows:

1. Actuate the carbon dioxide inflation assembly.

2. The liferaft must fully inflate to design shape, without evidence of restriction, in less than 1 minute. CDI must verify this inspection step.

If the raft does not properly inflate, determine the cause and enter reason in the remarks area of the inspection checkoff form. Determine the repairability and if the raft is beyond the capability of maintenance, the appropriate entry is entered on the checkoff form, and the assembly forwarded to supply. If a correction is made, the assembly must be functionally tested again.

To deflate the liferaft proceed as follows:

1. Attach the end of a rubber hose to a vacuum pump.
2. For deflation through the oral inflation valve, unlock the valve, hold it in the open position and hold the vacuum pump hose against the end of the oral inflation valve. When the compartment is collapsed, release the oral inflation valve and screw the lock closed.

To deflate the compartment through the topping-off valve, open the valve and hold the vacuum pump hose over the opening in the valve. When the compartment is collapsed, screw the valve closed.

VENTED "Y" MANIFOLD FUNCTIONAL TEST

The MK-20 liferaft functional test of the vented "Y" manifold, if applicable, is performed as follows:

1. Remove the moisture cap from the vented "Y" manifold.
2. Thread a pull test adapter into the manifold vent and insure that the vent is in the open (VENT) position.
3. Attach a spring scale to the adapter loop and apply a slow, steady pull until the vent "pops" closed. Note the amount of pull force required to close the vent. A 6- to 7-pound force is normally required to close the vent. If more than 7 pounds was required to close the vent, back out the Allen set screws equally with a 5/64 Allen wrench until the 6- to 7-pound requirement is met. If the force was less than 6 pounds, tighten the set screws equally until the 6- to 7-pound requirement is met.
4. Set the vent to the closed position.
5. Replace the moisture cap.

VISUAL INSPECTION

If the color, location, or stitching patterns of repaired, replaced, or previously incorporated noncritical items or features (e.g., raft pockets, handles, ballast bag, sea anchor, etc.) do not exactly conform to instructions, do not remove or rework the item or feature, if the flotation stability or capability and security of the attachment are not compromised.

The visual inspection consists of the following tasks:

1. Raft condition.
2. Raft configuration.
3. Marking (stenciling) inspection.
4. Survival items and accessories inspection.
5. Inflation assembly inspection.

When visually inspecting the raft for its condition, the raft must be inflated with air to 1 psig. Inspect the complete raft assembly for damage, proper adhesion, deterioration, security of attachment, etc.

For detailed information concerning liferaft visual inspections, refer to the applicable Shop Process Cards and NavAir 13-1-6.1.

Some of the markings inspection requirements are discussed in the following paragraphs.

All carbon dioxide inflation cylinders are painted gray and the markings should be black letters 1/4-inch high. Information on the cylinder should include gross weight, tare weight, weight of the carbon dioxide, and the date of the latest recharge. See table 15-1 for the weight of carbon dioxide charge.

Raft configuration inspections should be checked and updated by comparing the assembly to the applicable chapter concerned in NavAir 13-1-6.1.

Inventory all accessories and survival items by checking the applicable requirements tables listed in NavAir 13-1-6.1. Replace any missing item. Inspect all items for damage, spent contents, and expired service life. Operate all items which are not expended in use.

Table 15-1.–Carbon dioxide charge.

Raft Type	Weight (in lbs) of carbon dioxide
LR-1	0.49 to 0.51
LRU-7/P	0.49 to 0.51
MK-4	3.21 to 3.29
MK-7	4.64 to 4.76
MK-12A-1	4.74 to 4.86
MK-20	9.14 to 9.26

INFLATION ASSEMBLY INSPECTION

The inflation inspection consists of inspecting the inflation assembly while charged and discharged, and also performing the pull cable proof load test.

NOTE: When charged, there is carbon dioxide gas under pressure; do not attempt to remove the valve from the cylinder.

On multiplace rafts only check the cylinder for the date of last hydrostatic test. If the elapsed time is greater than 5 years replace it with a satisfactory cylinder. However, charged cylinders are considered serviceable regardless of the last hydrostatic test date. The cylinder must be discharged prior to replacement.

Weigh the inflation assembly and record the gross weight. If the weight indicated on the scale is not the same as the gross weight printed on the cylinder (with tolerance specified) or if no gross weight is printed on the cylinder, discharge the cylinder and recharge it in accordance with the applicable instructions. Continue the inspection procedures as outlined in NavAir 13-1-6.1.

Perform a proof load test on the multiplace rafts with a remote pull installation in the following manner:

1. Remove the inflation valve cover plate.
2. Remove the pull cable from the valve and apply a 50-pound pull force between the cable ball and snaphook.
3. Inspect the pull cable for broken strands of wire, deformed snaphook, security of the snaphook spring latch attachment, and loose or cracked swage fittings. If any damage is found, the pull cable must be discarded and replaced with a new cable. The new pull cable should also be tested. If the snaphook spring latch is loose, it may be repaired or replaced at the discretion of the inspection activity.

If the pull cable passes the proof load test, it must be reinstalled. Record the date that the proof load test was performed in the remarks column of the History Card.

All liferafts are subjected to a 4-hour leakage test each calendar or special inspection. To perform a leakage test, proceed in accordance with the information discussed in NavAir 13-1-6.1.

Record all updating and appropriate information on the record patch and History Card.

LIFERAFT MAINTENANCE

Maintenance of liferafts consists of cleaning the liferaft, its container and/or cases, recharging cylinders, and safety wiring the inflation valves.

When cleaning liferafts, Knights Spray Nine Cleaner is the preferred cleaning agent and it is commercially available.

NOTE: Solvents are not used in the cleaning of pneumatic liferafts.

When using a cleaning compound only, prepare a solution of 1 part cleaning compound MIL-C-25769G and 3 parts of water.

Apply the solution of Knights cleaner to the soiled area with a spray or swab. Allow the cleaning agent to remain on the surface for several minutes, then agitate the cleaner with a soft brush or rag.

Rinse the surface thoroughly with water, then wipe the area with a cloth or sponge. Repeat the application until the surface is free from all solution. Dry the raft with a lint-free cloth and apply a light coating of talcum powder. Clean the raft containers and/or cases in accordance with the procedures detailed in the previous paragraphs.

MK-4 LIFERAFT ASSEMBLY

The MK-4 liferaft assembly consists of an inflation assembly (carbon dioxide cylinder and inflation valve) and a four-man raft. Two types of carbon dioxide cylinders and four types of inflation valves are approved for service use. The liferaft is made up of a two-compartment main tube; an inflatable seat attached to the main

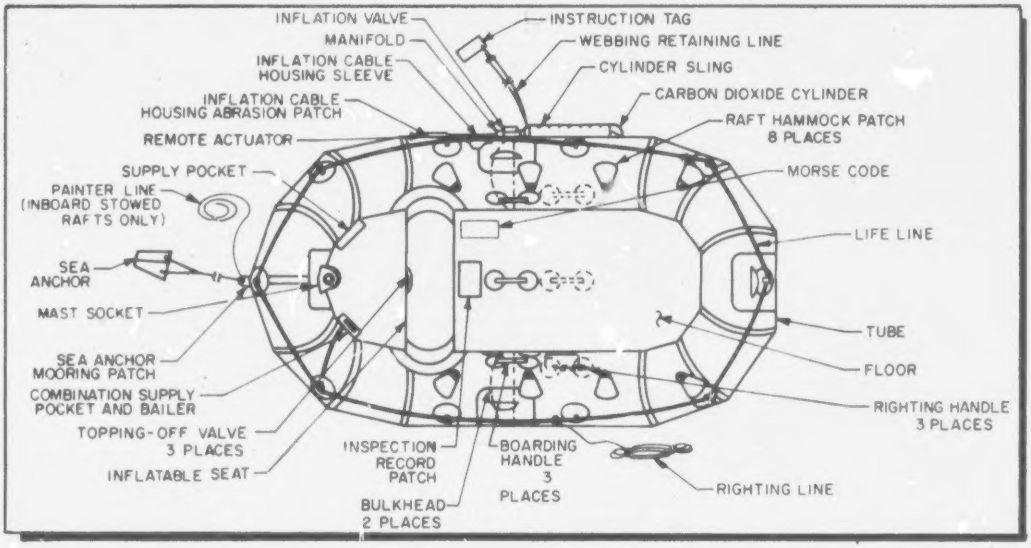
INFLATION VALVE
MANIFOLD
INFLATION CABLE HOUSING SLEEVE
INFLATION CABLE HOUSING ABRASION PATCH
REMOTE ACTUATOR
SUPPLY POCKET
PAINTER LINE (INBOARD STOWED RAFTS ONLY)
SEA ANCHOR
MAST SOCKET
SEA ANCHOR MOORING PATCH
COMBINATION SUPPLY POCKET AND BAILER
TOPPING-OFF VALVE 3 PLACES
INFLATABLE SEAT
INSPECTION RECORD PATCH
BULKHEAD 2 PLACES
BOARDING HANDLE 3 PLACES
RIGHTING LINE
RIGHTING HANDLE 3 PLACES
FLOOR
TUBE
LIFE LINE
MORSE CODE
RAFT HAMMOCK PATCH 8 PLACES
CARBON DIOXIDE CYLINDER
CYLINDER SLING
WEBBING RETAINING LINE
INSTRUCTION TAG

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Figure 15-2.—MK-4 liferaft assembly, parts nomenclature.

tube; a noninflatable floor attached to the bottom of the main tube and inflatable seat; and a sea anchor which is used to retard drifting. A lifeline, a righting line, a supply pocket, and a combination supply pocket and bailer are attached to the main tube.

Boarding and righting handles are attached to the main tube and the floor. Emergency survival equipment and raft accessories, stowed in accessory containers, are provided for the safety and survival of the aircrewmen. The lifeline also provides a means for securing the accessory containers to the liferaft. Topping-off valves are located on the main tube and inflatable seat. A MK-4 liferaft is shown in figure 15-2.

NOTE: To make up the packaged MK-4 liferaft assembly complete with accessories and survival items, all required components not supplied with the raft assembly must be individually requisitioned.

The MK-4 liferaft assembly (droppable) is inflated by pulling the inflation assembly actuating handle, located under the carrying case end flap. The MK-4 liferaft assembly (Raft Compartment Installation) is automatically inflated and ejected after the raft compartment door has been released. After boarding, the inflatable seat should be inflated through the topping off valves with the hand pump provided in the accessory container.

The MK-4 liferaft assembly can either be dropped to survivors or used by aircrewmen in the event of an aircraft ditching emergency. The raft is stowed in a readily accessible area inside the aircraft fuselage on all applicable aircraft except the E-1B and S-2 series.

Prior to packing any liferaft, the assembly must be updated by comparing the configuration of the assembly with the modifications listed in the applicable chapter in NavAir 13-1-6.1.

EQUIPMENT AND SURVIVAL ITEMS

Survival items are intended to provide a means for sustaining life, aiding in escape and evasion, and for a suitable detection capability. Survival items may be packed in liferafts, droppable kits, kits intended to be carried or worn by the aircrewmen, or they may be individually carried.

The equipment and survival items carried in the MK-4 liferaft assembly differs from that carried in other rafts basically in the quantity carried, with a few minor exceptions. Table 15-2 lists the MK-4 liferaft survival item requirements and the applicable item storage container.

Dye Marker

Dye marker is used to attract the attention of rescue aircraft. The dye is exhausted in 20 to 30 minutes and ceases to be a good target after 1 hour. The dye exposed water area is visible at approximate distance of 1 mile at 3,000 feet altitude. If rapid dispersion of the dye is desired, agitate the packet of dye vigorously in the water. Dye marker should never be used at the same time as shark repellent is used, since shark repellent gives off a dark color, and will hide the color of the dye marker. Dye markers are stowed in the accessory container.

Water Storage Bags

The water storage bags are made of strong transparent pliable plastic and will hold 5 quarts of water. The open end is reinforced and is designed to hold itself in a closed position. To seal the bag, use must be made of the strap and buckle located near its end. The bag can be sealed tightly by rolling or folding its opening for a short distance, and by securing the folds with the strap and buckle.

When the bag is not being used for holding water, it can be used for stowage of items in need of protection from salt water. Protecting articles in this manner can lead to contamination; therefore, articles should be wrapped in something to prevent lubricants and other contaminants from coming in direct contact with the interior of the bag. Water storage bags can also be inflated, coupled with one another, and used as water wings for swimming. Water storage bags are stowed in the accessory containers of rafts.

Table 15-2.—MK-4 liferaft survival item requirements and item storage container.

Survival item	Quantity required
Packed in the Accessory Container:	
Dye marker	3
Distress signal (Day/Night) MK-13 Mod 0	4
Water storage bag	2
Canned water 10 oz. (Can Opener) or 2 Desalter kits[1]	4
Shark repellent	2
First aid kit	1
Sunburn ointment	1
Rations	4
Bailing sponge	1
Hand pump Type II	1
Space blanket (12 oz.)	1
Hand generated flashlight[2]	1
Packed in the supplies and bailer pocket:	
Flare gun MK 79 Mod 0	1
Signal light (Strobe) SDU-5/E	1
Signal light (Steady Burning) 761-A	1
Signal mirror (Small)	1
Survival beacon[3,4]	1
Code card	1
Whistle	1
Compass (Pocket)	1
Pocket knife	1
Nylon cord Type I 50-foot	1

[1] All MK-2 desalter kits manufactured prior to 1961 are overaged; do not use. Kits manufactured after 1961 have an indefinite service life, may be used until damaged.

[2] Optional—Arctic regions only.

[3] Area Commander directs which type as stock levels dictate.

[4] Unless a suitable long range locater device such as the AN/CRT-3A is available, each multiplace raft should have an AN/URT-33 beacon installed in the raft supply pocket.

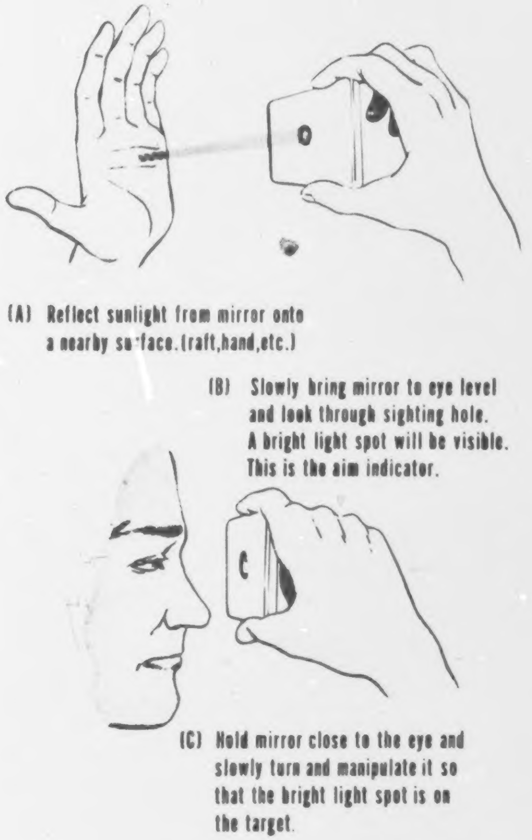
(A) Reflect sunlight from mirror onto a nearby surface.(raft,hand,etc.)
(B) Slowly bring mirror to eye level and look through sighting hole. A bright light spot will be visible. This is the aim indicator.
(C) Hold mirror close to the eye and slowly turn and manipulate it so that the bright light spot is on the target.

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Figure 15-3.—Operation of the signaling mirror.

Signaling Mirror

The emergency signalling mirror is approximately 3 x 5 inches and consists of an aluminized reflecting mirror glass, a back cover glass, and a sighting device. It is used by personnel in rafts or on land to attract attention of passing aircraft or ships by reflection either in sunlight or in hazy weather. The reflections of this shatterproof mirror can be seen at a distance 3 to 5 times as great as those which a raft can be sighted at sea. On a clear sunny day, the mirror will reflect the equivalent of 8 million candlepower. Flashes from the mirror have been seen from a distance of 40 miles.

Figure 15-3 illustrates the operation of the signaling mirror. Past experience indicates that personnel may have difficulty using the mirror in a bobbling raft at sea. Practice signaling with the mirror on the ground should be encouraged as part of the training program for flight crews. Such practice will reduce the difficulty in case of emergencies. Before using the mirror, read the instructions printed on the back of the mirror.

Nylon Cord

Nylon cord can be used to construct fish nets, snares, secure spring traps, tie down a windbreak, construct a bow or sling, repair clothes, construct a ladder, and as a fishing line. Nylon cord is provided in 50 foot lengths and has a breaking strength of 100 pounds.

Pocket Compass

The magnetic card type compass is encased in a cylindrical transparent plastic cover with a reference line inscribed on the top of the case. A circular card swings on a jeweled bearing, while a centered pivot supports and suspends the card in its free movement.

To cage the compass and protect the jeweled bearing, it is stored in an inverted position. The compass is reasonably shockproof, but it should be handled with care if one is to expect reliable readings. Damage to the case will impair its waterproof qualities, and promote corrosion in spite of its internal corrosion-resistant construction. Fittings outside of the base adapt the compass for wrist wear. One compass is provided for each raft and is stowed in the supply pocket.

The magnetic compass is primarily used for navigating purposes. A compass can also be used to locate iron-base stones (lodestones). Iron-base stones and flint, quartz or sandstone can be used to strike a fire.

Code Card

The code card, ground air emergency form shown in figure 15-4 contains aircraft distress signals, aircraft acknowledgement signals, liferaft paulin signals, and body signals. These

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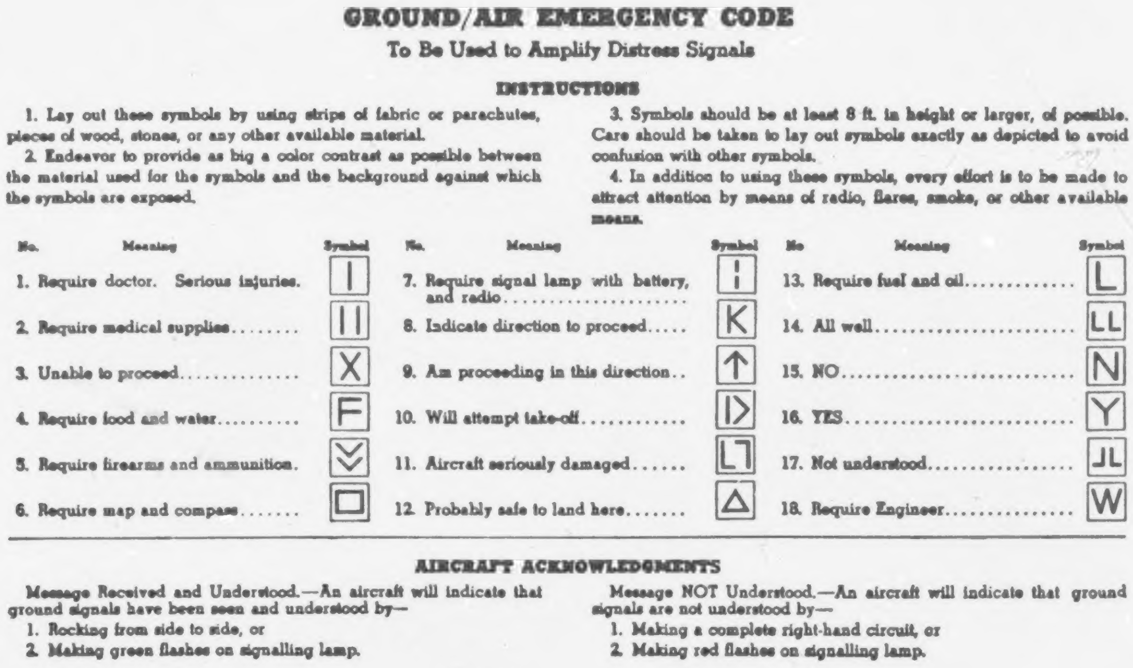

GROUND/AIR EMERGENCY CODE

To Be Used to Amplify Distress Signals

INSTRUCTIONS

1. Lay out these symbols by using strips of fabric or parachutes, pieces of wood, stones, or any other available material.

2. Endeavor to provide as big a color contrast as possible between the material used for the symbols and the background against which the symbols are exposed.

3. Symbols should be at least 8 ft. in height or larger, of possible. Care should be taken to lay out symbols exactly as depicted to avoid confusion with other symbols.

4. In addition to using these symbols, every effort is to be made to attract attention by means of radio, flares, smoke, or other available means.

No.	Meaning	Symbol	No.	Meaning	Symbol	No	Meaning	Symbol
1.	Require doctor. Serious injuries.	I	7.	Require signal lamp with battery, and radio	¦	13.	Require fuel and oil	L
2.	Require medical supplies	II	8.	Indicate direction to proceed	K	14.	All well	LL
3.	Unable to proceed	X	9.	Am proceeding in this direction	↑	15.	NO	N
4.	Require food and water	F	10.	Will attempt take-off	|>	16.	YES	Y
5.	Require firearms and ammunition.	≚	11.	Aircraft seriously damaged	L7	17.	Not understood	JL
6.	Require map and compass	□	12.	Probably safe to land here	△	18.	Require Engineer	W

AIRCRAFT ACKNOWLEDGMENTS

Message Received and Understood.—An aircraft will indicate that ground signals have been seen and understood by—

1. Rocking from side to side, or
2. Making green flashes on signalling lamp.

Message NOT Understood.—An aircraft will indicate that ground signals are not understood by—

1. Making a complete right-hand circuit, or
2. Making red flashes on signalling lamp.

(FRONT)

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Figure 15-4.--Code card, ground/air emergency.

signals should be used if communications equipment is not operable, no communications equipment is available, or if radio silence is required.

First Aid Kit

The first aid kit contains various medical supplies to prevent diseases or to aid injured or sick personnel. First aid kits or medical supplies may be included as part of a survival kit. The kits are stored in the accessory container.

Pocket Knife

The pocket knife consists of one large blade, a combination screwdriver and bottle opener, and one can opener. The pocket knife is a general purpose survival tool. It can be used to cut wood or material, open cans, prepare food, and as a weapon. When in a raft, one should never let the opened knife dangle from its lanyard or lie on the bottom of the raft.

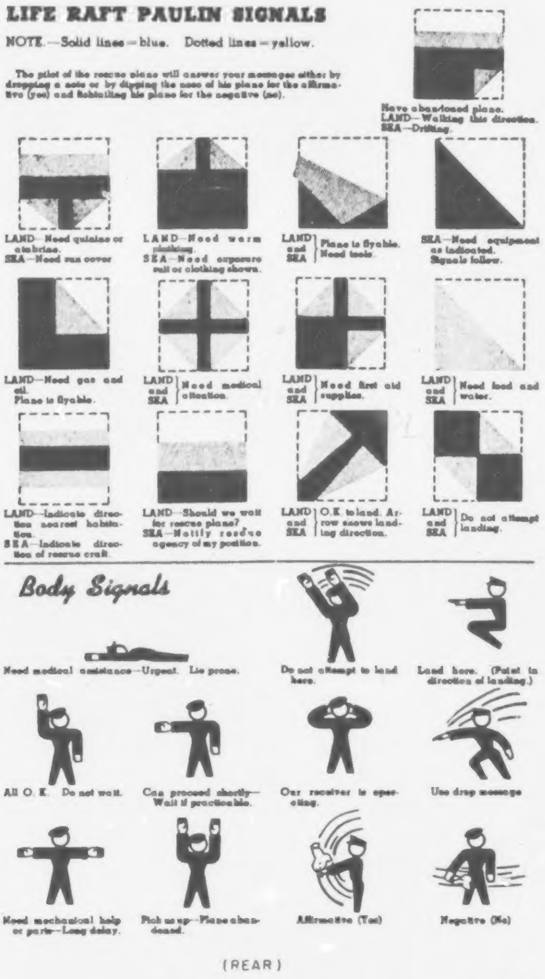
LIFE RAFT PAULIN SIGNALS
NOTE.—Solid lines = blue. Dotted lines = yellow.
The pilot of the rescue plane will answer your messages either by dropping a note or by dipping the nose of his plane for the affirmative (yes) and fishtailing his plane for the negative (no).
Have abandoned plane. LAND—Walking this direction. SEA—Drifting.
LAND—Need quinine or atabrine. SEA—Need sun cover
LAND—Need warm clothing. SEA—Need exposure suit or clothing shown.
LAND and SEA Plane is flyable. Need tools.
SEA—Need equipment as indicated. Signals follow.
LAND—Need gas and oil. Plane is flyable.
LAND and SEA Need medical attention.
LAND and SEA Need first aid supplies.
LAND and SEA Need food and water.
LAND—Indicate direction nearest habitation. SEA—Indicate direction of rescue craft.
LAND—Should we wait for rescue plane? SEA—Notify rescue agency of my position.
LAND and SEA O.K. to land. Arrow shows landing direction.
LAND and SEA Do not attempt landing.
Body Signals
Need medical assistance—Urgent. Lie prone.
Do not attempt to land here.
Land here. (Point in direction of landing.)
All O. K. Do not wait.
Can proceed shortly—Wait if practicable.
Our receiver is operating.
Use drop message
Need mechanical help or parts—Long delay.
Pick us up—Plane abandoned.
Affirmative (Yes)
Negative (No)
(REAR)

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Figure 15-4.—Code card, ground/air emergency—Continued.

Signal Lights

Distress signal lights are used to attract the attention of SAR aircraft, ships, or ground rescue parties. The SDU-5/E (strobe light) emits a high intensity flashing light visible for great distances. The 761-A (Matrix light) emits a steady light that is beamed, by a special lens, at the horizon, 45 degrees and straight up. It can also be used as a flashlight.

Sunburn Ointment

Sunburn ointment should be applied before exposure to the sun. For most effective results, rub the ointment well into the skin. The ointment can be used in this same way to give protection from windburn in cold areas.

Paulin Life Saving

The paulin is a piece of rubber coated, nylon fabric in two sizes dependent upon the raft size. The coated side is nonspecular blue and the other side is bright red. The paulin may be used as a raft cover or signaling device at sea, and as a tent or signaling device on land. Liferaft paulin signals are printed on the GND/AIR emergency code form. (See fig. 15-4.)

Hand Pump

The hand pump is used to inflate liferaft seats, inflatable floors and other compartments not inflated by the liferaft inflation assembly. The pump is also used to top-off an inflated raft or maintain inflation of a leaky raft.

Rations

Ration packets contain candy and gum. Rations are not primarily items for subsistence but they do produce energy.

Shark Repellant

Shark repellant is used to provide protection against sharks. The packet contents dissolve in 3 1/2 hours and produce a black coating on the water's surface.

Bailing Sponge

One or more sponges may be included in the liferaft assemblies. They can be used to catch rain water, bail out a raft, for personal hygiene, as fishing bait (a small piece soaked in animal blood), and for other purposes.

Whistle

The whistle is used for attracting attention of a rescue ship or personnel in foggy weather, or at night.

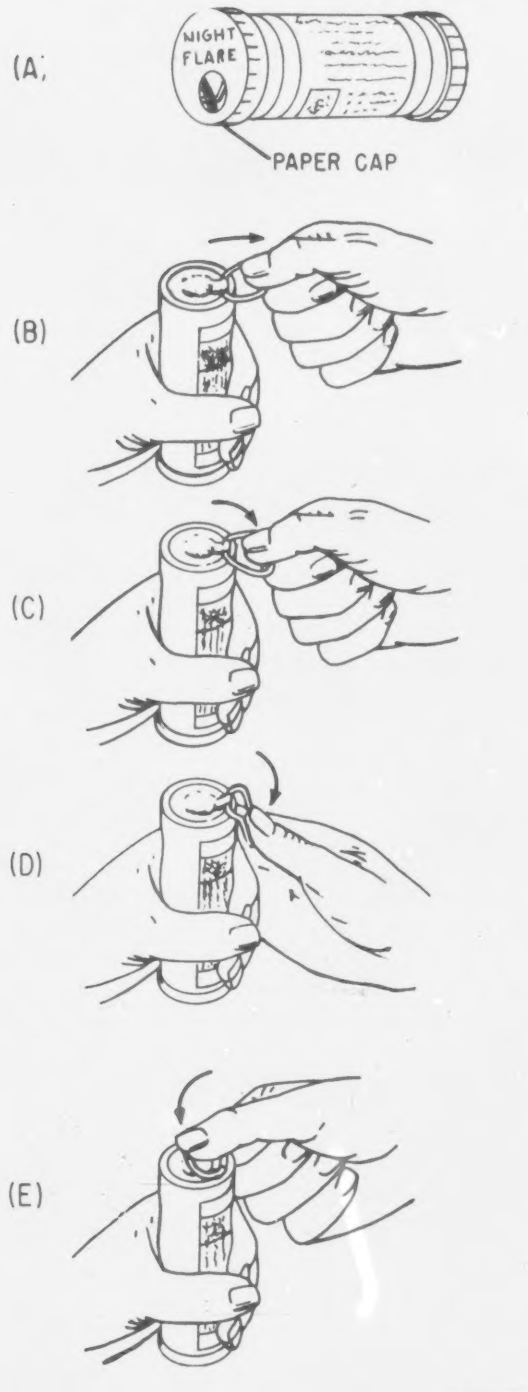

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Figure 15-5.—Igniting the MK-13 Mod 0 distress signal.

SPECIAL WHISTLE INSPECTION.—To inspect the whistle, proceed as follows:

1. Insure that the whistle side disks are not loose or missing. Inspect the whistle for cracks and damage to the ball. Damaged or defective whistles must be replaced.

2. The whistle should be blown with a normal blow (regular exhalation); it should also be blown with an over blow (forced exhalation). If the whistle fails to emit a highly audible sound, it should be replaced.

Distress Signal Day/Night MK-13 Mod 0

This signal is used to attract the attention of SAR aircraft and to give pickup aircraft the wind drift direction. The night end of the flare produces a red flame and the day end produces an orange smoke. Each end burns for approximately 20 seconds.

The night flare can be identified in the dark by a series of small beadlike projections that are embossed around its circumference. After selecting the flare to be used, the sealing tape should then be torn off from around the end of the cylinder and the paper cap removed. Figure 15-5 illustrates the step by step procedures for using the Mk 13 Mod 0 distress signal. Grasp the pull ring and flip it over the rim of the signal case as shown in 15-5(B). Press down the overhanging ring with your thumb until the seal snaps, as shown in (C). If the seal refuses to snap with this kind of force, continue pressing on the ring so that it bends over the rim and against the signal body as shown in (D). Flip the bent ring back to the top of the signal and press down (E), using the bent pull ring as a lever. After the seal breaks, point the signal away from your face and body and give a sharp yank on the pull ring. Hold the signal at an angle of approximately 45 degrees from the horizontal with your arm fully extended. Care should be taken not to drop any of the contents on the user or the raft. After one end of the signal has been expended, it may be cooled by immersing in water and then saved until both ends have been used. The distress signal should be cool before being stored.

Desalter Kit

The desalter kit is used to make fresh water from salt water. Each chemical desalting briquet will purify 16 ounces of water.

The desalter kit consists of a hinged metal container with a retaining lanyard, seven or eight wrapped desalting briquets, a length of mending tape, and a plastic bag for processing the water to be desalted. The briquets, processing bag, and mending tape are attached to a nylon tie tape, to each other, and to the metal container. The desalter kits are stowed in the accessory container.

The vinylite bag should be rinsed to decrease the taste which passes into the treated water. This is done by filling the bag one-third full of sea water and rubbing the inner surfaces of the bag gently for 2 minutes, then rinsing several times with fresh sea water.

The chemical process is purposely adjusted to leave a little salt in the desalted water to compensate for perspiration losses. If a less salty taste is desired, a smaller amount of water can be used in the bag.

The procedure for using the desalter kit follows:

1. Close valve at the bottom and fill bag to line with sea water.
2. Take out one package of chemical and close container.
3. Remove outer wrapping of briquet, tear off one end of transparent inner wrapping, and pour all of the chemical into the bag of sea water.
4. Fold the top of the bag down tightly, rolling it towards the buckle and strap to make a watertight seal.
5. Permit the chemical to stand in the bag for a few minutes, and it will disintegrate.
6. Further pulverize the chemical by kneading it gently for 15 minutes.
7. Shake the bag gently for 30 minutes.
8. To drink the water, unscrew the valve located at the bottom of the bag, being careful not to squeeze the bag. Put the tube in the mouth, and gently squeeze the bag or suck on the tube. Spit out the first few drops if too salty.
9. When finished drinking, close valve. The remaining water can be left stowed in the bag.
10. When all the water has been drawn from the bag, rinse out the chemical with sea water. The bag is then ready for reuse.
11. In case the bag becomes damaged, dry the affected area carefully and apply a patch of the mending tape provided.

If the plastic bag becomes damaged beyond repair, or is lost, the metal container can be used. In this case, fill the container to the line marked on the inside. Then add one package of the chemical and shake the can gently for 30 minutes. Drink the water through an emergency filter, made by holding a piece of cloth over the top of the can.

Flare Gun MK-79 Mod 0

The illumination signal kit MK-79 Mod 0 is a hand held signal flare gun used for day and night signaling to attract the attention of SAR aircraft or ground rescue parties. Each kit consists of seven MK-80-1 screw-in cartridge flares and one MK-31 pencil type launcher.

The signal launcher projects a 12,000 candlepower, red star, hand fired signal to altitudes in excess of 200 feet. Each cartridge flare has a duration of 4 1/2 seconds minimum.

OPERATING INSTRUCTIONS.–Operating instructions for the MK-79 Mod 0 signal flare are as follows:

1. Pull the trigger screw into the angular safety slot.
2. Mate the launcher with the screw-in flare.
3. Hold launcher, arm fully extended overhead.
4. Grip the launcher firmly. With a snapping thumb action, pull the trigger from the safety slot which releases it into the firing slot.
5. If the cartridge misfires, at least one more attempt should be made to fire the signal.

Radios And Beacons

Survival radios and beacons are used for different purposes. The radio is used to establish two-way communications, on one or more channels, between aircrewmen and rescue personnel. The beacon is used to transmit only a swept-tone beacon signal. Radios and beacons are sometimes combined into one system. Beacons are automatically activated by various means.

All survival items, including radios and beacons, must be periodically inspected. In general, the inspection consists of updating the configurations, inspecting for damage, excessive wear, corrosion, expended contents, and expiration of service life.

Survival items are inspected upon issue and thereafter at intervals which coincide with the inspection schedule of the kit or assembly in which the item is used.

With few exceptions, maintenance of survival items is restricted to replacement of the item that fails to pass the inspection.

PACKING PROCEDURES REMOTE OR LOCAL PULL

Prior to packing the MK-4 liferaft assembly, it must be updated by comparing the configuration of the assembly with the modifications listed in NavAir 13-1-6.1.

To pack a MK-4 liferaft assembly, proceed as follows:

NOTE: This information applies to all methods of packing unless a specific method (remote or local) is specified in parenthesis in front of the step.

1. Insure that the raft, carrying case, and accessory container have been inspected.

2. Insure that the survival items and raft accessories have been inspected for expiration and damage.

3. Wrap all sharp or pointed metallic accessories and survival items with rubber coated cloth and secure the object with rubber bands. Stow the accessories and survival items in the accessory container and supplies and bailer pocket in accordance with table 15-2.

4. Cover the inflation valve with several layers of rubber coated cloth, and secure the covering with cloth based, pressure sensitive tape. Fake the webbing retaining line, righting line, and sea anchor line, and secure them with rubber bands. Insure that all of the topping off valves are closed.

5. Tie the accessory container to the lifeline and stow the container in the raft. Use a 10 foot length of type III nylon cord for tying the accessory container to the lifeline.

6. Fold the raft in accordance with figure 15-6, for local inflation.

Fold the raft in accordance with figure 15-7, for remote inflation.

7. Insert the folded raft into the carrying case so that the actuating handle or pull cable housing is positioned under the carrying case end flap.

8. Secure the carrying case snap fasteners.

NOTE: If the actuator cable snap is not soldered, wrap tape around the hook to prevent possible loss of the spring latch.

9. (Remote). Rig the pull cable housing to the carrying case ripcord.

10. (Remote). Install the ripcord, and safety tie the first and last ripcord pins by passing a 12-inch length of size A nylon thread, single, under the ripcord pin. Secure the thread to the ripcord cable with 3 or 4 half-hitches.

11. (Remote). Snap the ripcord protector flap closed, position the ripcord handle under the carrying case end flap, and snap the end flap closed.

12. (Local). Insure that the inflation valve actuating handle is positioned outside the carrying case end flap, and snap the end flap closed.

Rafts that are stowed inboard on the aircraft are secured to the aircraft with a painter line. The painter line is a 60 foot length of cotton cord (unless otherwise specified by the applicable aircraft MIM) type I, size 4 with a 50 to 150 pound static breaking strength. The painter line retains deployed rafts to the aircraft during emergency egress but will easily break if the aircraft sinks. The painter line is attached to the sea anchor mooring patch loop unless otherwise specified by applicable MIM. The painter line is stowed in the painter line pouch which is placed under the packed raft if possible.

When the MK-4 liferaft assembly is packed for aircraft nacelle or raft compartment installation, it must be installed in accordance with the applicable MIM.

All MK-4 rafts installed in the S-2/E-1B aircraft are packed for down pull inflation using a "snap hook" remote actuator assembly con-

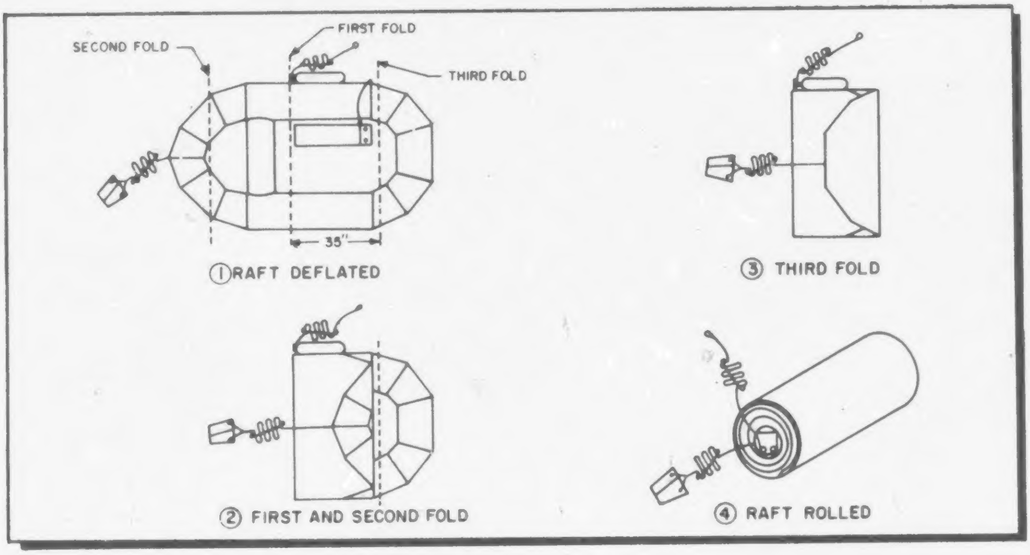
SECOND FOLD
FIRST FOLD
THIRD FOLD
35"
① RAFT DEFLATED
③ THIRD FOLD
② FIRST AND SECOND FOLD
④ RAFT ROLLED

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Figure 15-6.–MK-4 raft folding procedures (Local).

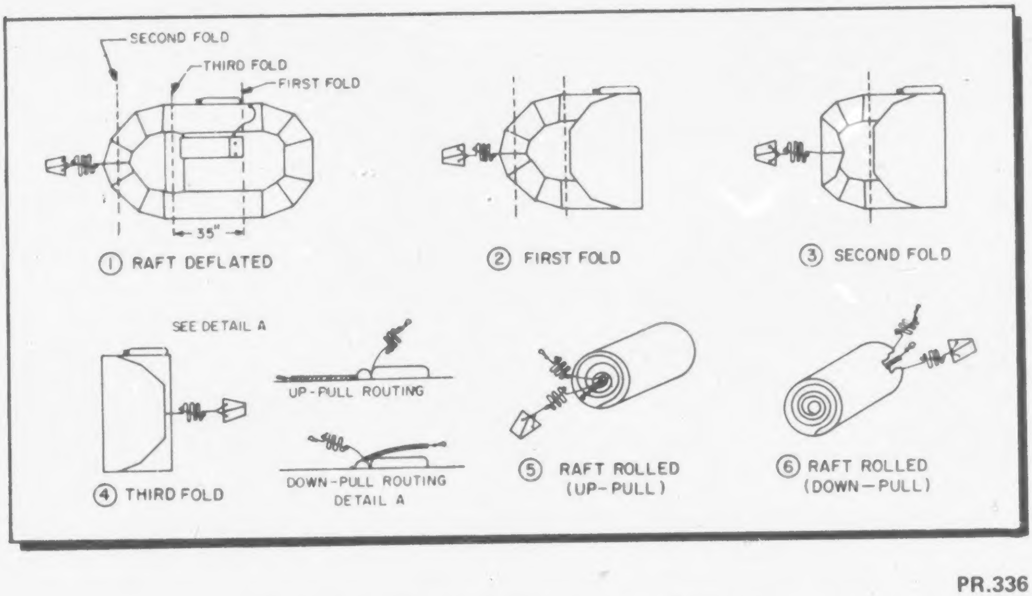
SECOND FOLD
THIRD FOLD
FIRST FOLD
35"
① RAFT DEFLATED
② FIRST FOLD
③ SECOND FOLD
SEE DETAIL A
UP-PULL ROUTING
DOWN-PULL ROUTING
DETAIL A
④ THIRD FOLD
⑤ RAFT ROLLED (UP-PULL)
⑥ RAFT ROLLED (DOWN-PULL)

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Figure 15-7.–MK-4 raft folding procedures (Remote).

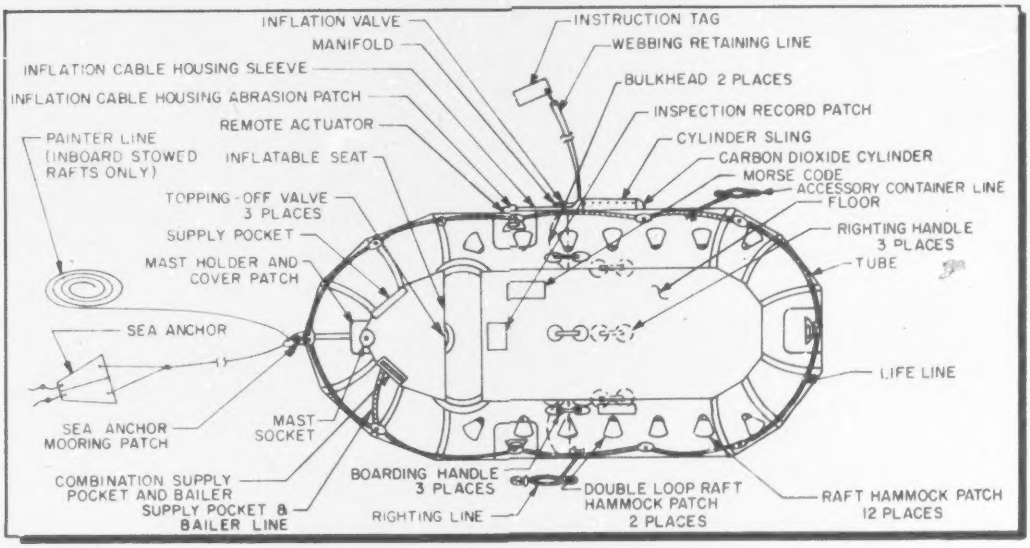
INFLATION VALVE
MANIFOLD
INFLATION CABLE HOUSING SLEEVE
INFLATION CABLE HOUSING ABRASION PATCH
REMOTE ACTUATOR
PAINTER LINE (INBOARD STOWED RAFTS ONLY)
INFLATABLE SEAT
TOPPING-OFF VALVE 3 PLACES
SUPPLY POCKET
MAST HOLDER AND COVER PATCH
SEA ANCHOR
SEA ANCHOR MOORING PATCH
MAST SOCKET
COMBINATION SUPPLY POCKET AND BAILER
SUPPLY POCKET & BAILER LINE
BOARDING HANDLE 3 PLACES
RIGHTING LINE
DOUBLE LOOP RAFT HAMMOCK PATCH 2 PLACES
INSTRUCTION TAG
WEBBING RETAINING LINE
BULKHEAD 2 PLACES
INSPECTION RECORD PATCH
CYLINDER SLING
CARBON DIOXIDE CYLINDER
MORSE CODE
ACCESSORY CONTAINER LINE
FLOOR
RIGHTING HANDLE 3 PLACES
TUBE
LIFE LINE
RAFT HAMMOCK PATCH 12 PLACES
PR.339

Figure 15-8.—MK-7 liferaft assembly, parts nomenclature.

sisting of a snap hook pull cable, and a pull cable housing assembly. In no instance will "ice tong" remote actuator assemblies be used. A 38 1/2- by 19-inch piece of rubber coated, cotton cloth is placed over the MK-4 rafts stowed in S-2 aircraft compartments.

MK-7 LIFERAFT ASSEMBLY

The MK-7 liferaft assembly consists of an inflation assembly (carbon dioxide cylinder and inflation valve) and a seven man raft. Two types of carbon dioxide cylinders and four types of inflation valves are approved for service use. The liferaft is made up of a two compartment main tube; an inflatable seat attached to the main tube; a noninflatable floor attached to the bottom of the main tube and inflatable seat; and a sea anchor which is used to retard drifting. A lifeline, a righting line, a supply pocket, and a combination supply bag and bailer are attached to the main tube. Boarding and righting handles are attached to the main tube and the floor. Emergency survival equipment and raft accessories, stowed in the accessory containers, are provided for the safety and survival of the aircrewmen. The lifeline also provides a means for securing the accessory containers to the liferaft. Topping off valves are located on the main tube and the main seat. Figure 15-8 shows the MK-7 liferaft assembly, parts nomenclature.

EQUIPMENT AND SURVIVAL ITEMS

The MK-7 liferaft equipment and survival item requirements and the applicable storage container is listed in table 15-3.

PACKING PROCEDURES REMOTE OR LOCAL PULL

Prior to packing the MK-7 liferaft assembly, it must be updated by comparing the configuration of the assembly with the modifications listed in NavAir 13-1-6.1.

The MK-7 liferaft assembly may be packed for remote up- or down-pull or manual raft inflation, or for installation into the aircraft nacelle or raft compartment. The method used for packing depends upon the aircraft application.

Table 15-3.–MK-7 liferaft survival item requirements and item storage container.

Survival Item	Quantity required
Packed in the Accessory Container:	
Dye marker	4
Distress signal (Day/Night) MK-13 Mod 0	6
Water storage bag	3
Canned water 10 oz. (Can Opener) or 4 desalter kits[1]	7
Shark repellent	2
First aid kit	1
Sunburn ointment	1
Rations	7
Bailing sponge	1
Hand pump Type II	1
Space blanket (12 oz.)	2
Hand generated flashlight[2]	1
Packed in the supplies and bailer pocket:	
Flare gun MK 79 Mod 0	1
Signal light (Strobe) SDU-5/E	1
Signal light (Steady burning) 761A	1
Signal mirror (Small)	1
Survival beacon[3,4,5]	1
Code card	1
Whistle	1
Compass (Pocket)	1
Pocket knife	1
Nylon cord Type I 50-foot	1

[1] All MK-2 desalter kits manufactured prior to 1961 are overaged; do not use. Kits manufactured after 1961 have an indefinite service life; they may be used until damaged.

[2] Optional–Arctic regions only.

[3] Area Commander directs which type as stock levels dictate.

[4] Unless a suitable long range locator device such as the AN/CRT-3A is available, each multiplace raft should have an AN/URT-33 beacon installed in the raft supply pocket.

[5] Only P-3C type aircraft to be equipped with the AN/PRT-5 Emergency Transmitter (two per aircraft).

NOTE: The inflation cable housing must not be inserted through the abrasion patch sleeve when folding and packing the raft. The cable housing should be inserted into the sleeve after the raft is inflated.

To pack a MK-7 liferaft assembly, proceed as follows:

NOTE: Packing procedures will apply to all methods of packing unless a specific method (remote or local) is specified in parenthesis in front of the step.

1. Insure that the raft, carrying case, and accessory container have been inspected.

2. Insure that the survival items and raft accessories have been inspected for expiration and damage. Refer to table 15-3 for items used.

3. Wrap all sharp or pointed metallic accessories and survival items with rubber coated cloth, and secure the objects with rubber bands. Stow the accessories and survival items in the accessory container, or the supplies and bailer pocket, as applicable.

4. Cover the inflation valve with several layers of rubber coated cloth, and secure it with cloth-based, pressure sensitive tape. Fake the webbing retaining line, righting line, sea anchor mooring line, and secure them with rubber bands. Insure that all of the topping off valves are closed.

5. Using a 10-foot length of type III nylon cord, tie the accessory equipment container to the lifeline and stow the container inside the raft.

6. Fold the raft in accordance with figure 15-9, for remote inflation.

Fold the MK-7 raft in accordance with figure 15-10, for local inflation.

7. Insert the folded raft into the carrying case so that the actuating handle or pull cable housing is positioned under the carrying case end flap.

8. Secure the carrying case snap fasteners.

NOTE: If the actuator cable snap hook is not soldered, wrap tape around the hook to prevent possible loss of the spring latch.

9. (Remote). Rig the pull cable housing to the carrying case ripcord.

10. (Remote). Install the ripcord and safety tie the first and last ripcord pins by passing a 12-inch length of size A nylon thread under the ripcord pin. Secure the thread to the ripcord cable with 3 or 4 half-hitches.

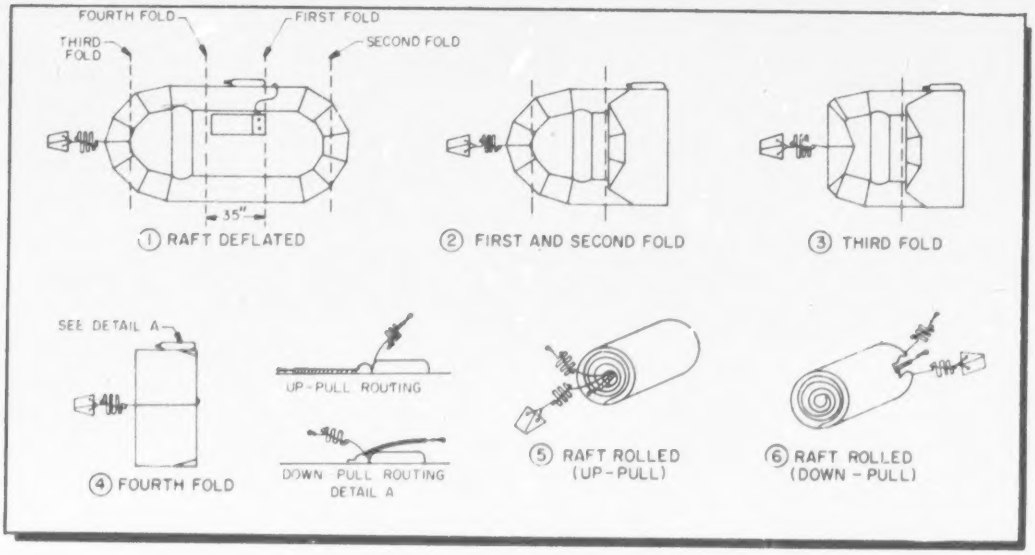
FOURTH FOLD
FIRST FOLD
THIRD FOLD
SECOND FOLD
35"
① RAFT DEFLATED
② FIRST AND SECOND FOLD
③ THIRD FOLD
SEE DETAIL A
UP-PULL ROUTING
DOWN PULL ROUTING
DETAIL A
④ FOURTH FOLD
⑤ RAFT ROLLED (UP-PULL)
⑥ RAFT ROLLED (DOWN-PULL)

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Figure 15-9.—MK-7 raft folding procedures (Remote).

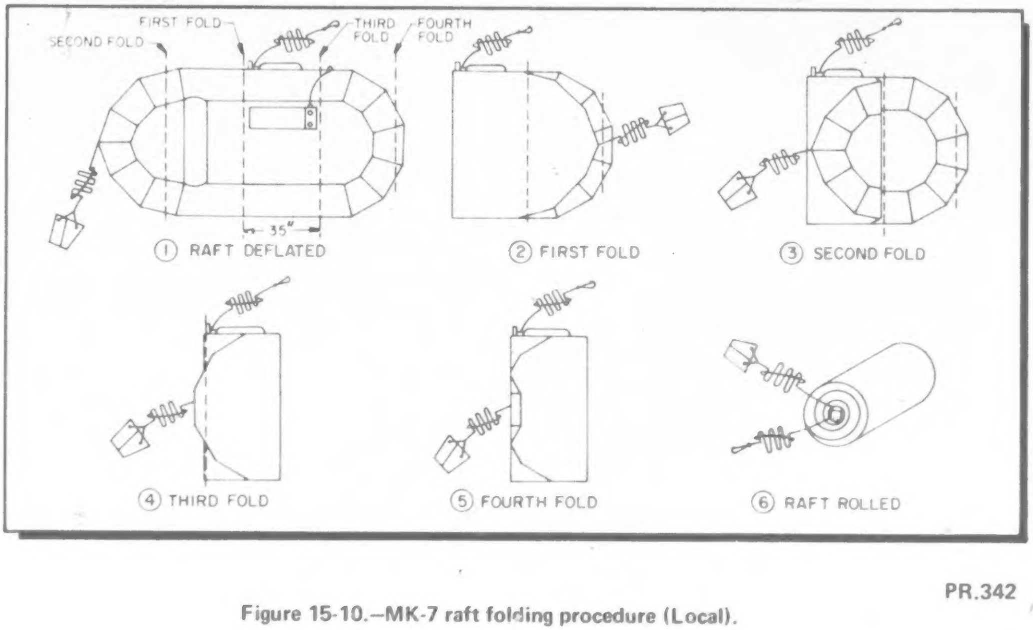
FIRST FOLD
SECOND FOLD
THIRD FOLD
FOURTH FOLD
35"
① RAFT DEFLATED
② FIRST FOLD
③ SECOND FOLD
④ THIRD FOLD
⑤ FOURTH FOLD
⑥ RAFT ROLLED

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Figure 15-10.—MK-7 raft folding procedure (Local).

NOTE: Rafts stowed inboard on aircraft are secured to the aircraft with a painter line. The painter line is a 60 foot length of cotton cord (unless otherwise specified by the applicable aircraft MIM), type I, size 4 with a 50 to 150 pound static breaking strength.

The painter line retains the deployed raft to the aircraft during emergency egress but will easily break if the aircraft sinks. The painter line is attached to the sea anchor mooring patch loop unless otherwise specified by the applicable aircraft MIM. Stow the painter in the painter line pouch and place the pouch under the packed raft if possible.

11. (Remote). Snap the ripcord protector flap closed, position the ripcord handle under the carrying case end flap, and snap the end flap closed.

12. (Local). Insure that the inflation valve actuating handle is positioned outside the carrying case end flap, and snap the end flap closed.

When the MK-7 liferaft assembly is packed for installation into the aircraft nacelle or raft compartment, follow procedures outlined in the applicable aircraft MIM.

All MK-7 liferaft assemblies installed in C-1A aircraft must be packed for down pull inflation using the "snap hook" remote actuator assembly consisting of a snap hook pull cable assembly, and a pull cable housing assembly. In no instance are "ice-tong" remote actuator assemblies to be used in C-1A aircraft.

MK-12A-1 LIFERAFT ASSEMBLY

The MK-12A-1 liferaft assembly consists of an inflation assembly (carbon dioxide cylinder and inflation valve) and a 12-man raft. Two types of carbon dioxide cylinders and four types of inflation valves are approved for service use.

The liferaft is made up of a two-compartment main tube; a smaller single-compartment upper tube, permanently attached to the top of the main tube; an inflatable seat, attached to the main tube; a noninflatable floor, attached to the bottom of the main tube and seat; a two-section inflatable floor, tied to the inside of the noninflatable floor; and a sea anchor which is used to retard drifting.

A lifeline and two supply pockets are attached to the main tube. Boarding and righting handles are attached to the main tube and both floors. Survival equipment and raft accessories, stowed in the accessory containers, provides for the safety and survival of the aircrewmen. The lifeline also provides a means for securing the accessory containers to the raft. Topping off valves are located on the upper tube, inflatable seat, and on both sections of the inflatable floor. The MK-12A-1 liferaft assembly, parts nomenclature is shown in figure 15-11.

EQUIPMENT AND SURVIVAL ITEMS

CNO has established survival equipment lists as standards to be utilized by all concerned. These lists provide for an effective 24 hour survival capability.

The MK-12A-1 liferaft equipment and survival item requirements and the applicable storage container is listed in table 15-4.

NOTE: To make up the packaged liferaft assembly complete with accessories and survival items, all required components not supplied with the raft assembly must be individually requisitioned.

OPERATION

The MK-12A-1 liferaft assembly is inflated by pulling the inflation assembly actuating handle, located under the carrying case end flap. The inflation assembly inflates the main tube only. After boarding the raft, the upper tube, seat, and floor sections should be inflated through the topping off valves, with the hand pump provided in the accessory container.

The MK-12A-1 liferaft assembly can either be dropped to survivors or used by aircrewmen in the event of an emergency. The raft is stowed either in a readily accessible area inside the aircraft fuselage or in an aircraft compartment designed for rafts.

Prior the packing, the MK-12A-1 liferaft assembly should be updated by comparing the configuration of the assembly with the modifications listed in NavAir 13-1-6.1.

The MK-12A-1 liferaft assembly may be packed for remote up- or down-pull or local raft inflation. The method used depends upon aircraft application.

Table 15-4.–MK-12A-1 liferaft survival item requirements and item storage container.

Survival item	Quantity required
Packed in the Accessory Container:	
Dye marker	5
Distress signal (Day/Night) MK-13 Mod 0	8
Water storage bag	4
Canned water 10 oz. (Can Opener) or 6 desalter kits[1]	12
Shark repellent	3
First aid kit	1
Sunburn ointment	2
Rations	12
Bailing sponge	2
Hand pump Type II	1
Space blanket (12 oz.)	2
Hand generated light[2]	1
Packed in the supplies and bailer pocket:	
Flare gun MK 79 Mod 0	1
Signal light (Strobe) SDU-5/E	1
Signal light (Steady burning) 761A	1
Signal mirror (Small)	1
Survival beacon[3,4,5]	1
Code card	1
Whistle	1
Compass (Pocket)	1
Pocket knife	1
Nylon cord Type I 50-foot	1

[1] All MK-2 desalter kits manufactured prior to 1961 are overaged; do not use. Kits manufactured after 1961 have an indefinite service life; they may be used until damaged.

[2] Optional–Arctic regions only.

[3] Area Commander directs which type as stock levels dictate.

[4] Unless a suitable long range locator device such as the AN/CRT-3A is available, each multiplace raft should have an AN/URT-33 beacon installed in the raft supply pocket.

[5] Only P-3C type aircraft to be equipped with the AN/PRT-5 Emergency Transmitter (two per aircraft).

PACKING PROCEDURES, REMOTE OR LOCAL PULL

To pack the MK-12A-1 liferaft assembly, proceed as follows:

NOTE: The packing procedures apply to all methods of packing unless a specific method (remote or local) is specified in parenthesis in front of the step.

1. Insure that the raft carrying case and accessory containers have been inspected as previously discussed in this chapter.

2. Insure that the survival items and raft accessories have been inspected for expiration and damage. Refer to table 15-4 for the items used.

3. Wrap all sharp or pointed metallic accessories and survival items with rubber coated cloth and secure the objects with rubber bands. Stow the accessories and survival items in their applicable container; refer to table 15-4.

4. Cover the inflation valve with several layers of rubber coated cloth, and secure the assembly with cloth based, pressure sensitive tape. Fake the webbing retaining line and sea anchor mooring line, and secure them with rubber bands. Close the topping off valves.

5. Tie the accessory containers to the lifeline using a 10-foot length of type III nylon cord for each container. Stow the containers inside the liferaft.

6. Fold the raft in accordance with figure 15-12 for remote inflation.

For local inflation, fold the raft in accordance with figure 15-13.

7. Insert the folded raft into the carrying case so that the actuating handle or pull cable housing is positioned under the carrying case end flap.

8. Secure the carrying case snap fasteners.

9. (Remote). Rig the pull cable housing to the carrying case ripcord.

10. (Remote). Install the ripcord, and safety tie the first and last ripcord pins by passing a 12-inch length of size A nylon thread, single,

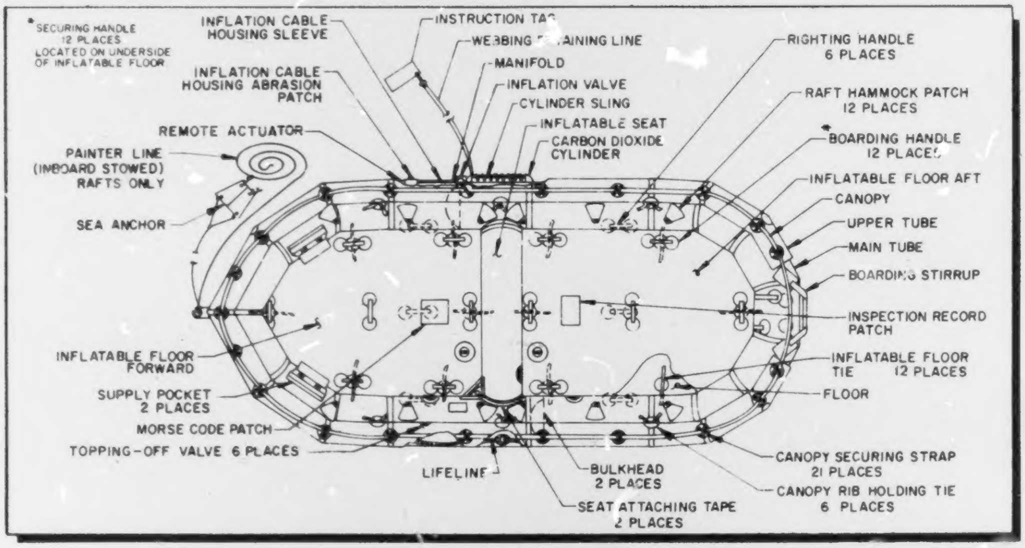
*SECURING HANDLE
12 PLACES
LOCATED ON UNDERSIDE
OF INFLATABLE FLOOR
INFLATION CABLE HOUSING SLEEVE
INSTRUCTION TAG
WEBBING RETAINING LINE
MANIFOLD
INFLATION VALVE
CYLINDER SLING
INFLATABLE SEAT
CARBON DIOXIDE CYLINDER
INFLATION CABLE HOUSING ABRASION PATCH
REMOTE ACTUATOR
PAINTER LINE (INBOARD STOWED) RAFTS ONLY
SEA ANCHOR
RIGHTING HANDLE 6 PLACES
RAFT HAMMOCK PATCH 12 PLACES
*BOARDING HANDLE 12 PLACES
INFLATABLE FLOOR AFT
CANOPY
UPPER TUBE
MAIN TUBE
BOARDING STIRRUP
INSPECTION RECORD PATCH
INFLATABLE FLOOR TIE 12 PLACES
FLOOR
INFLATABLE FLOOR FORWARD
SUPPLY POCKET 2 PLACES
MORSE CODE PATCH
TOPPING-OFF VALVE 6 PLACES
LIFELINE
BULKHEAD 2 PLACES
SEAT ATTACHING TAPE 2 PLACES
CANOPY SECURING STRAP 21 PLACES
CANOPY RIB HOLDING TIE 6 PLACES

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Figure 15-11.–MK-12A-1 liferaft assembly, parts nomenclature.

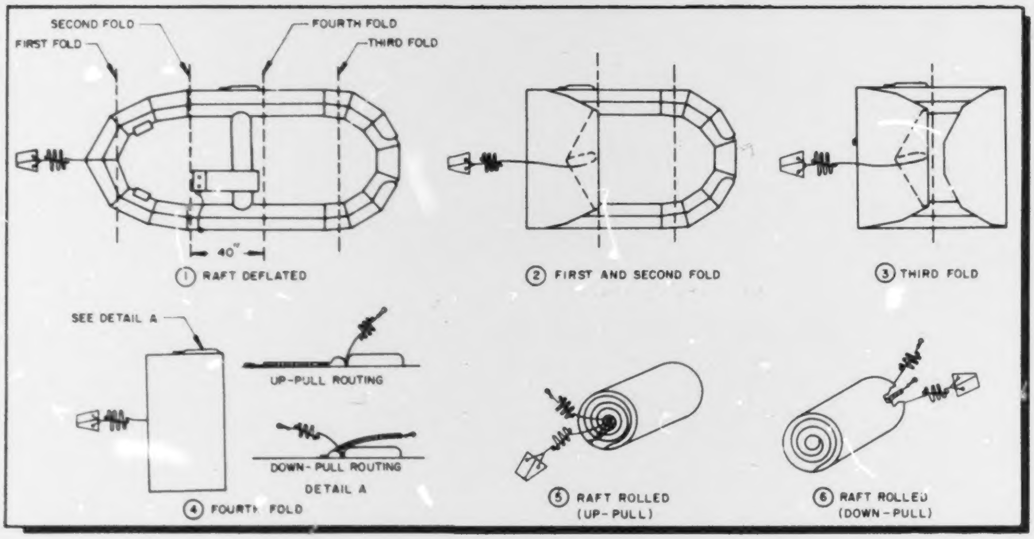
SECOND FOLD
FIRST FOLD
FOURTH FOLD
THIRD FOLD
40"
① RAFT DEFLATED
② FIRST AND SECOND FOLD
③ THIRD FOLD
SEE DETAIL A
UP-PULL ROUTING
DOWN-PULL ROUTING
DETAIL A
④ FOURTH FOLD
⑤ RAFT ROLLED (UP-PULL)
⑥ RAFT ROLLED (DOWN-PULL)

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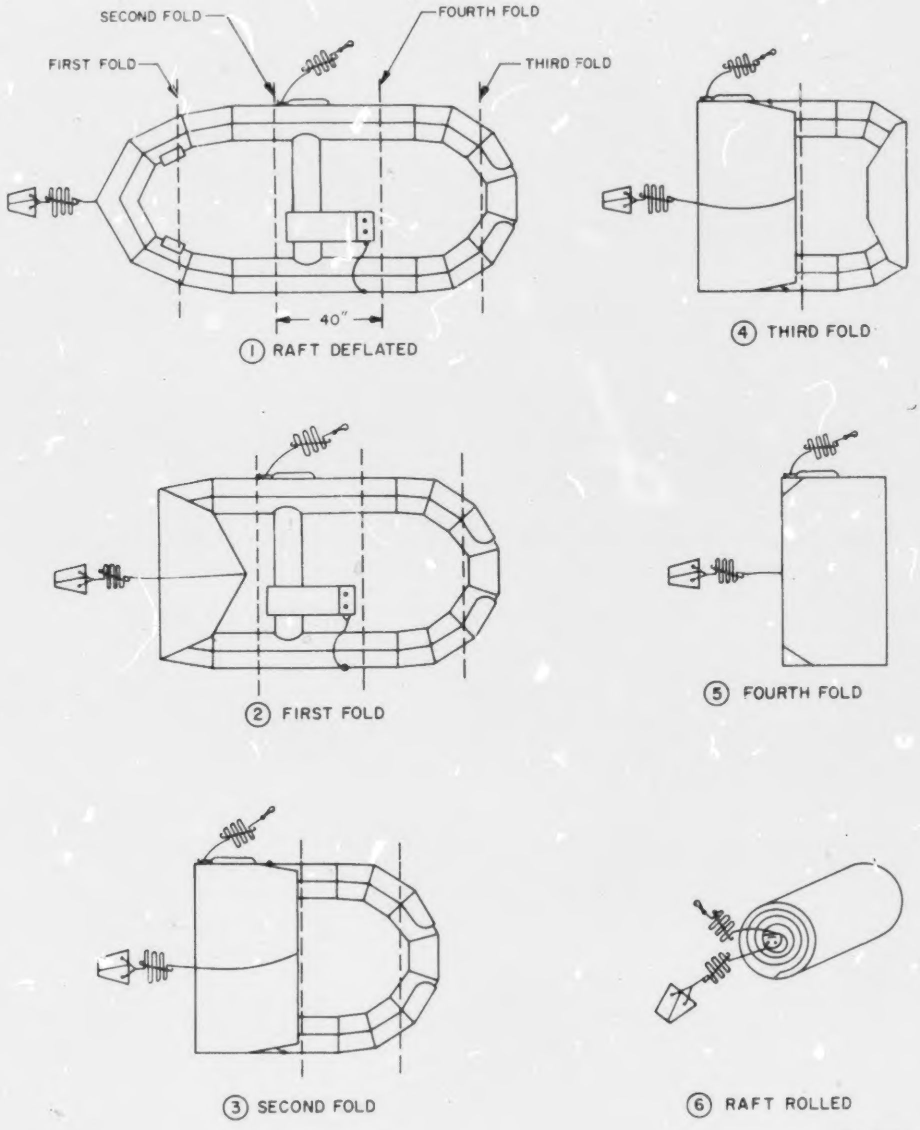
Figure 15-12.–MK-12A-1 liferaft folding procedure, remote pull.



① RAFT DEFLATED

④ THIRD FOLD

② FIRST FOLD

⑤ FOURTH FOLD

③ SECOND FOLD

⑥ RAFT ROLLED

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Figure 15-13.—MK-12A-1 liferaft folding procedure, local pull.

under the ripcord pin. Secure the thread to the ripcord cable with three or four half-hitches.

NOTE: Rafts stowed inboard on aircraft should be secured to the aircraft with a painter line. The painter line is a 60-foot length of cotton cord (unless otherwise specified by the applicable aircraft MIM), type I, size 4 with a 50 to 150 pound static breaking strength. The painter line retains the deployed raft to the aircraft during emergency egress but will easily

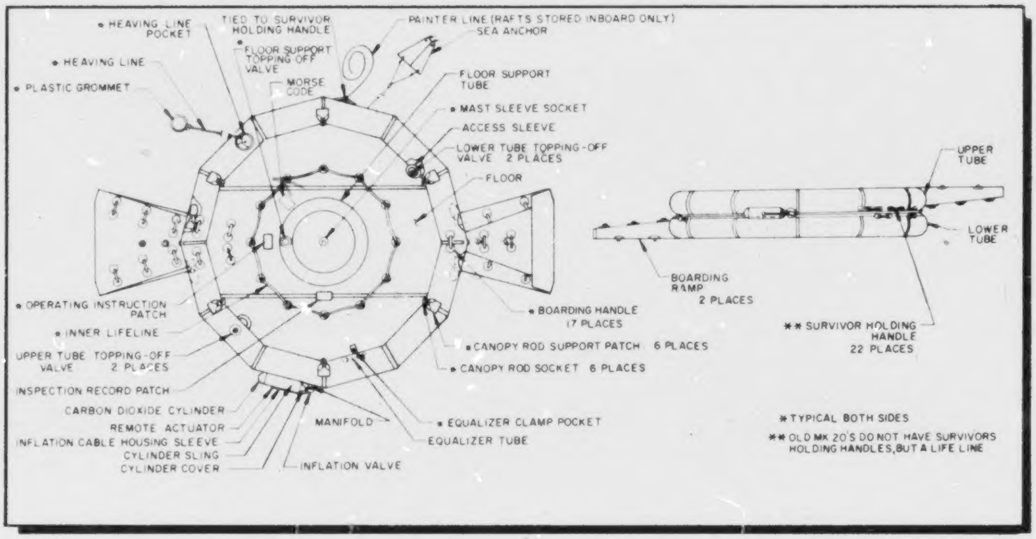
* HEAVING LINE POCKET
TIED TO SURVIVOR HOLDING HANDLE
* FLOOR SUPPORT TOPPING OFF VALVE
PAINTER LINE (RAFTS STORED INBOARD ONLY)
SEA ANCHOR
* HEAVING LINE
* PLASTIC GROMMET
MORSE CODE
FLOOR SUPPORT TUBE
* MAST SLEEVE SOCKET
ACCESS SLEEVE
LOWER TUBE TOPPING-OFF VALVE 2 PLACES
FLOOR
UPPER TUBE
LOWER TUBE
BOARDING RAMP 2 PLACES
* OPERATING INSTRUCTION PATCH
* INNER LIFELINE
UPPER TUBE TOPPING-OFF VALVE 2 PLACES
INSPECTION RECORD PATCH
* BOARDING HANDLE 17 PLACES
* CANOPY ROD SUPPORT PATCH 6 PLACES
* CANOPY ROD SOCKET 6 PLACES
** SURVIVOR HOLDING HANDLE 22 PLACES
CARBON DIOXIDE CYLINDER
REMOTE ACTUATOR
INFLATION CABLE HOUSING SLEEVE
CYLINDER SLING
CYLINDER COVER
MANIFOLD
INFLATION VALVE
* EQUALIZER CLAMP POCKET
EQUALIZER TUBE
* TYPICAL BOTH SIDES
** OLD MK 20'S DO NOT HAVE SURVIVORS HOLDING HANDLES, BUT A LIFE LINE

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Figure 15-14.—MK-20 liferaft assembly, parts nomenclature.

break if the aircraft sinks. The painter line is attached to the sea anchor mooring patch loop unless otherwise specified by the applicable aircraft MIM.

The painter line is stowed in the painter line pouch, and the pouch is placed under the packed raft if possible.

11. (Remote). Snap the ripcord protector flap closed, position the ripcord handle under the carrying case end flap, and snap the end flap closed.

12. (Local). Insure that the inflation valve actuating handle is positioned under the carrying case end flap, and snap the end flap closed.

MK-20 LIFERAFT ASSEMBLY

The MK-20 liferaft assembly consists of an inflation assembly (carbon dioxide cylinder, inflation valve, and cover) and a 20-man liferaft. Two types of carbon dioxide cylinders and four types of inflation valves are approved for service use.

The liferaft is made up of two single compartment circular tubes connected by an equalizer tube; a noninflatable floor suspended between the circular tubes; and a boarding ramp permanently attached to each circular tube. The floor is equipped with a built-in inflatable floor support and the inflatable boarding ramps are located on opposite sides of the raft.

A sea anchor, used to retard drifting, is stowed in the sea anchor pocket which is located at the junction of the circular tubes. An inner lifeline, boarding handles, a heaving line, and emergency survival equipment, stowed in accessory containers, are provided for the safety and survival of the aircrewmen. The inner lifeline, attached to the floor, and the boarding handles, attached to the circular tubes and boarding ramps, also provide a means for securing the accessory container to the raft. Topping off valves are located on each side of the tubes. A topping off valve is also located on each side of the floor support. The MK-20 liferaft assembly, parts nomenclature is shown in figure 15-14.

Table 15-5.–MK-20 liferaft survival item requirements and item storage container.

Survival item	Quantity required
Packed in the Accessory Container (Wing Installation):	
Signaling mirror, Type II	1
Dye marker	6
Whistle, Type II	1
Flashlight, hand generated[1]	1
GND/AIR Emergency code form	1
Signal, Smoke and Illumination, Marine MK-13 Mod 0	10
Shark repellent	4
Space blanket (12 oz.)	3
First aid kit	1
Sunburn ointment	3
Rations	20
Water storage bag	7
Canned water (Can Opener) (Or 10 Desalter Kits, MK-2, Type II)[2]	20
Pocket knife	1
Compass (Pocket or Wrist Type)	1
Hand Pump, Type II	2
Nylon cord, Type I, 50-foot	1
Bailing sponge	2
Survival radio[3,4]	1
MK-79, Mod 0 Signal (Flare Gun)	2
Signal light (SDU–5/E)	1
Signal light 761A	1
Packed in the Accessory Container (Droppable):	Droppable
Signaling mirror, Type II	1
Dye marker	6
Whistle, Type II	1
Flashlight, Hand Generated[1]	1
GND/AIR Emergency Code Form	1
Water storage bag	7
Canned water (Can Opener) (Or 10 Desalter Kits, MK-2, Type II)[2]	20
Space blanket (12 oz.)	3
Pocket knife	1
Compass (Pocket or Wrist type)	1
Hand pump, Type II	2
Nylon cord, Type I, 50-foot	1
Bailing sponge	2

Table 15-5.–MK-20 liferaft survival item requirements and item storage container.–Continued

Survival item	Quantity required
Packed in the Accessory Container (Droppable):	Droppable
Survival radio[2,3]	1
Signal, Smoke and Illumination, Marine MK-13 Mod 0	10
First aid kit	1
Sunburn ointment	3
Rations	20
MK-79, Mod 0 Signal (Flare Gun)	2
Signal light (SDU-5/E)	1
Signal light 761A	1

[1] Optional–Arctic regions only.

[2] All MK-2 desalter kits manufactured prior to 1961 are overaged; do not use. Kits manufactured after 1961 have an indefinite service life; they may be used until damaged.

[3] Area commander directs which type as stock levels dictate.

[4] Unless a suitable long range locator device such as the AN/CRT-3A is available, each multiplace liferaft has an AN/URT-33 beacon installed in the raft.

EQUIPMENT AND SURVIVAL ITEMS

The MK-20 liferaft equipment and survival item requirements and the applicable storage container is listed in table 15-5.

The MK-20 liferaft assembly (droppable) is inflated by pulling the inflation assembly handle, located under the carrying case end flap.

The MK-20 liferaft assembly (wing installation) is automatically inflated and ejected from the raft compartment after the liferaft compartment door has been released. A unique design feature of the MK-20 is that it is always right side up after inflation. The inflation assembly inflates the circular tubes and boarding ramps only. In the event that the inflation assembly does not function properly, the equalizer tube distributes gas equally between each circular tube. After boarding, the floor support is inflated with the hand pump provided in the accessory container. The circular tubes may be topped off, if necessary, from either side of the raft floor.

The MK-20 liferaft assembly can be either dropped to survivors or used by aircrewmen in the event of an emergency. Each type of packaged MK-20 liferaft assembly is used in certain types of aircraft; for applicable configurations, refer to the aircraft MIM.

Prior to packing the MK-20 liferaft assembly, it must be updated by comparing the configuration of the assembly with the modifications listed in NavAir 13-1-6.1.

PACKING PROCEDURES

The MK-20 liferaft assembly may be packed for droppable, remote up- or down-pull; droppable manual pull; or wing installation remote up- or down-pull. The method used depends upon the aircraft application.

Packing Procedures For The MK-20 (Droppable, Remote Up-Pull Or Down-Pull)

To pack a droppable, remote up-pull or down-pull MK-20 liferaft assembly, proceed as follows:

1. Insure that the raft, carrying case, and accessory containers have been inspected.
2. Insure that the survival items and raft accessories have been inspected for expiration and damage.
3. Wrap all sharp or pointed metallic accessories and survival items with rubber coated cloth, and secure each object with rubber bands.
4. Stow the accessories and survival items in the accessory containers. Refer to table 15-5.
5. Insure that the topping off valves are closed.
6. Cover the inflation valve and manifold with several layers of rubber coated cloth, and secure the unit with cloth based, pressure sensitive tape. Insure that the applicable cover is used to cover the inflation assembly. Fake the webbing retaining line and sea anchor mooring line, and secure them with rubber bands.
7. Stow the sea anchor and faked mooring line in the sea anchor pocket.
8. Stow the heaving lines in the heaving line pocket.
9. Fold the raft in accordance with figure 15-15. Position the accessory containers on the folded raft and tie them to the nearest survivor holding handle using a 10-foot length of Type III nylon cord, for each container.
10. Insert the rolled raft into the carrying case so that the pull cable housing is positioned under the carrying case end flap.
11. Secure the carrying case snap fasteners.
12. Rig the pull cable housing to the carrying case ripcord, install the ripcord, and safety-tie the first, middle, and last ripcord pins by passing a 12-inch length of size A nylon thread, single, under the ripcord pin. Secure the thread to the ripcord cable with three or four half-hitches.
13. Snap the ripcord protector flap closed, position the ripcord handle under the carrying case end flap, and snap the end flap closed.

NOTE: Rafts stowed inboard on aircraft are secured to the aircraft with a painter line. The painter line is a 60 foot length of cotton cord (unless otherwise specified by the applicable aircraft MIM), Type I, size 4 with a 50 to 150 pound static breaking strength. The painter line retains deployed rafts to the aircraft during emergency egress but will easily break if the aircraft sinks.

The painter line is attached to the survivor holding handle (tube section 7) unless otherwise specified by the applicable aircraft MIM. The painter line is stowed in the painter line pouch which is placed under the packed raft if possible.

Packing Procedures For The MK-20 (Droppable, Local Pull)

Procedures for packing the MK-20 liferaft assembly (Droppable, Local Pull) are the same as the procedures detailed for the MK-20 (Droppable, Remote Up Pull or Down Pull), except for the following steps.

9. Fold the liferaft in accordance with figure 15-16.

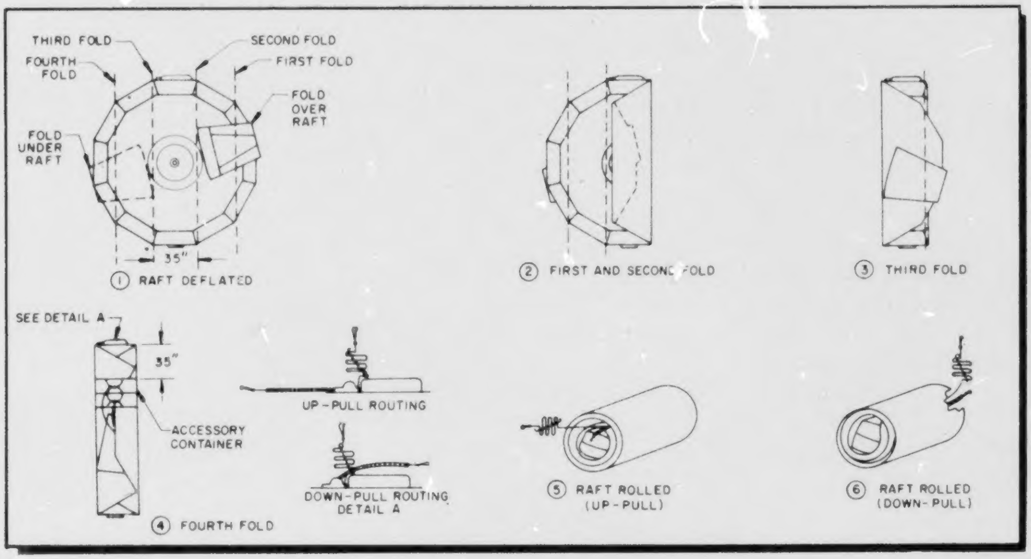
THIRD FOLD
SECOND FOLD
FOURTH FOLD
FIRST FOLD
FOLD OVER RAFT
FOLD UNDER RAFT
35"
① RAFT DEFLATED
② FIRST AND SECOND FOLD
③ THIRD FOLD
SEE DETAIL A
35"
ACCESSORY CONTAINER
UP-PULL ROUTING
DOWN-PULL ROUTING DETAIL A
④ FOURTH FOLD
⑤ RAFT ROLLED (UP-PULL)
⑥ RAFT ROLLED (DOWN-PULL)

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Figure 15-15.—MK-20 folding procedure (droppable remote).

10. Insert the rolled raft into the carrying case so that the actuating handle is positioned under the carrying case end flap.

11. Insure that the inflation valve actuating handle is positioned outside the carrying case end flap, and snap the end flap closed.

Packing Procedures For The MK-20 (Wing Installation, Remote Up Pull Or Down Pull)

To pack a MK-20 liferaft assembly for wing installation, remote up pull or down pull, proceed using the same procedures as discussed for the other MK-20 rafts. (See fig. 15-17.)

Insert the rolled raft and accessory containers into the carrying case, and secure the snap fasteners.

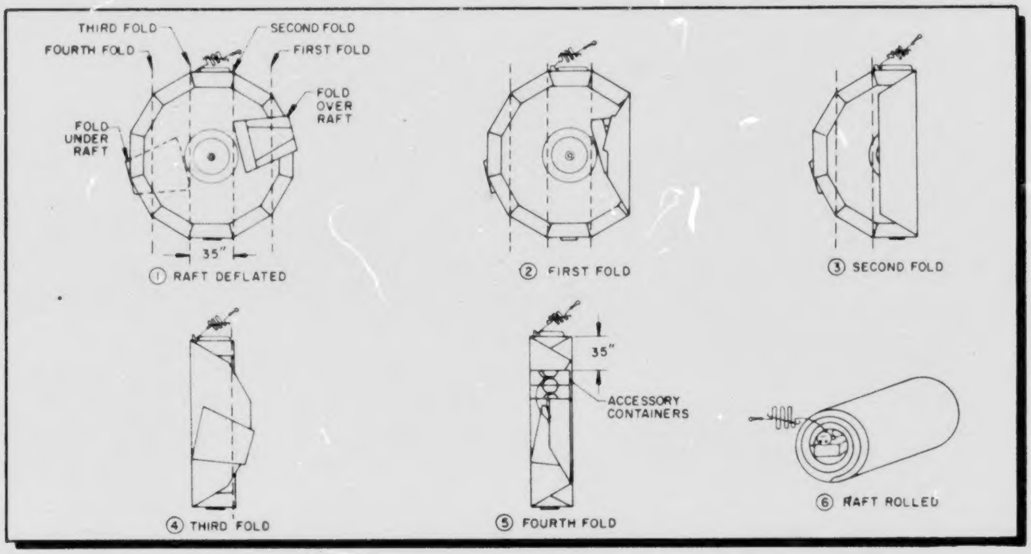
NOTE: The wing installation carrying case is used to carry the liferaft assembly to and from the aircraft. The raft assembly should be installed in the wing compartment in accordance with the applicable instructions and directives.

MAINTENANCE OF RAFTS

All personnel engaged in the handling, inspection, or maintenance of rafts must exercise caution to avoid stepping on or placing any unnecessary objects or items on top of them. Persons engaged in maintenance or repair of unpacked rafts must not step on any part of the raft while wearing shoes, nor on any part of the flotation tubes at any time. Rafts must not be thrown around or dropped since this may cause damage to the raft or its accessories. Particular care must be exercised to prevent hydrocarbons such as gasoline, oil, or grease from coming in contact with any part of the raft or its equipment.

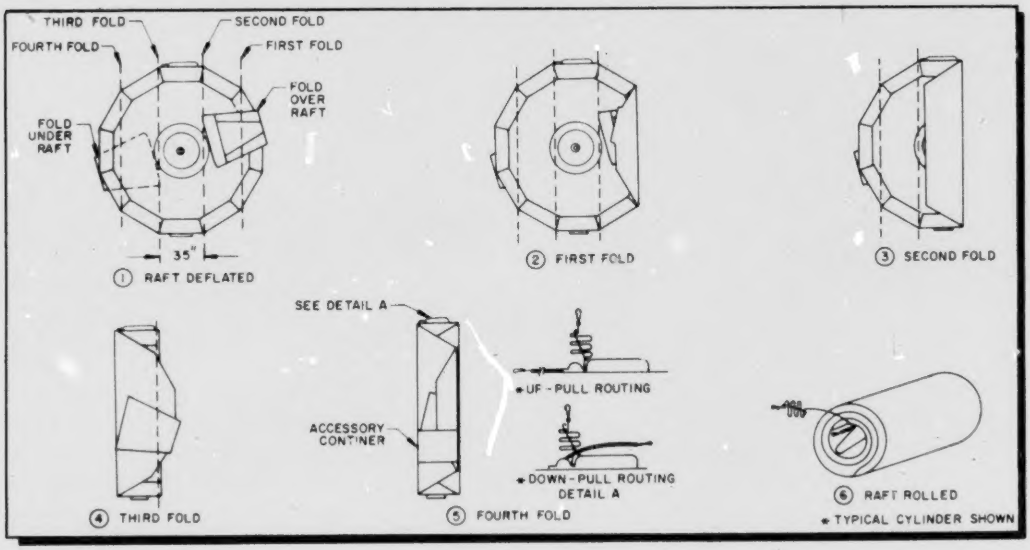
Repairs

Personnel engaged in the repair of rafts and other rubberized flotation equipment must be thoroughly familiar with NavAir 13-1-6.1 and know the various types and uses of cements as well as the correct procedures to be followed when making necessary repairs to this equipment.


THIRD FOLD
SECOND FOLD
FOURTH FOLD
FIRST FOLD
FOLD OVER RAFT
FOLD UNDER RAFT
35"
① RAFT DEFLATED
② FIRST FOLD
③ SECOND FOLD
35"
ACCESSORY CONTAINERS
④ THIRD FOLD
⑤ FOURTH FOLD
⑥ RAFT ROLLED

PR.349

Figure 15-16.–MK 20 folding procedure (droppable local).


THIRD FOLD
SECOND FOLD
FOURTH FOLD
FIRST FOLD
FOLD OVER RAFT
FOLD UNDER RAFT
35"
① RAFT DEFLATED
② FIRST FOLD
③ SECOND FOLD
SEE DETAIL A
ACCESSORY CONTAINER
*UP-PULL ROUTING
*DOWN-PULL ROUTING DETAIL A
④ THIRD FOLD
⑤ FOURTH FOLD
⑥ RAFT ROLLED
*TYPICAL CYLINDER SHOWN

PR.350

Figure 15-17.–MK-20 folding procedure (wing installation).

Emergency Repairs

Emergency repair of the MK-20 raft, when in the water, is accomplished by the use of the metal clamp type plugs provided in the accessory equipment container of each raft. No emergency repair equipment is provided with other types of rafts.

Safety Precautions

Cements and solvents are flammable materials and must be treated as such. Never smoke nor permit any type of open flame near cements or solvents when they are being used. After completion of any repair work involving these materials, always replace caps or covers as tightly as possible. The container should be stored in a cool storeroom. Common sense and a few precautions will avoid many accidents. WHEN WORKING WITH CEMENTS AND SOLVENTS, DO SO IN A WELL-VENTILATED SPACE.

STOWAGE OF RAFTS

Pneumatic survival equipment of any kind should never be stowed near hot places, batteries, auxiliary powerplant, stoves, inverters, or the like. Frequent inspection and occasional discipline will also be necessary in order to detect and stop pilferage of the contents of stowed rafts. Nonflying squadron personnel must be made aware of the dangers which may result from pilferage.

Rafts carried in aircraft not equipped with raft compartments should be stowed in the fuselage in a manner and position that will render them readily available. This will save much valuable time for personnel in abandoning the aircraft during a ditching. Rafts stowed in the fuselage should retain their carrying cases.

Because of the nature of materials used in raft construction, both flight and maintenance personnel should avoid sitting on rafts or placing heavy tools or other equipment on them.

DEMONSTRATING THE USE OF RAFTS

Many ditchings and water crashes occur in a rough sea or at night. Only complete familiarization with the use of survival equipment will give the aircrewman a chance of survival under such adverse conditions. Therefore, intensive drill in the use of rafts and their associated equipment is essential for safety.

The survival officer will be concerned with survival techniques and should see that a survival training program is set up in the parachute loft. In most cases, the chief-in-charge of the loft will have the responsibility of setting up this training. As a PR3 or PR2 you will have many occasions to participate in this training, and in many instances may be completely responsible for the carrying out of the program. Regardless of who is in charge and must shoulder the complete responsibility, it is the duty of every PR to be completely familiar with all phases of survival training and be able to demonstrate the use of survival equipment.

A very effective system of training in water survival techniques is the use of the Dilbert Dunker to simulate an actual aircraft ditching as closely as possible and to teach the best escape procedure with full equipment.

Although such complete courses of training cannot be conducted in certain localities because of the lack of specialized equipment, the PR should make every attempt to give aircrewmen frequent practice in the actual use of the equipment. Discussions, demonstrations, and shop lectures are all helpful, but working with the actual raft equipment is the only way to acquire the knowledge essential to survival.

In demonstrating the raft's use, the most important thing to stress is that the retainer lanyard snap is firmly attached to the ring on the lifevest before inflating the raft. Inflate the raft as soon as possible so that personnel can get out of the water. Inflation of the raft is effected by pulling on the short length cable attached to the CO_2 cylinder valve. After several hours, the CO_2 cylinder may be removed from the side of the raft. It tends to chafe the side of the compartment and acts as an anchor, causing the raft to orbit around it. Sometimes it is possible to back off the coupling between the cylinder and the manifold so that the cylinder releases from the mount. Once the cylinder has been removed, it will no longer be useful in any way and should be thrown over the side. This, of course, is under actual emergency conditions; in a training

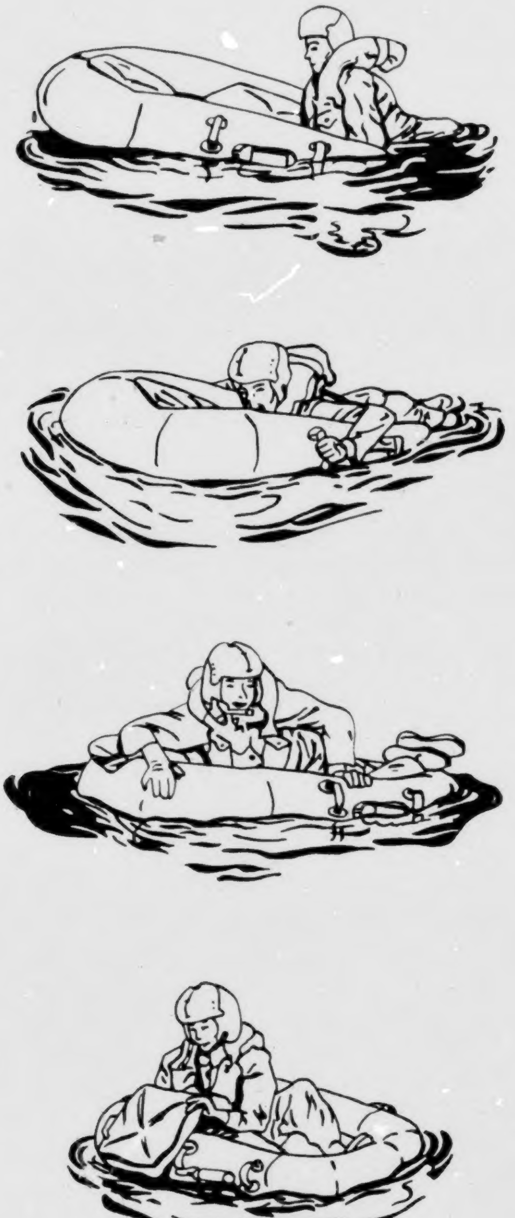


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Figure 15-18.—Boarding the LR-1 raft.

demonstration, the cylinder should be saved and recharged for further use on the training equipment.

In demonstrating their use, instructions should also be given on manual inflation of rafts. If nothing happens after the CO_2 cable has been pulled, the carrying case should be pulled off and the raft unfolded so that the hand pump will be accessible. After the pump is removed, the first compartment to be inflated should be the seat. This will help keep the raft afloat so that the remaining compartments can be inflated with the pump. In attaching the pump, care must be taken not to screw the pump too tightly to the valve. If it is too tight, it may freeze and be impossible to loosen without some type of wrench or pliers.

Boarding the Raft

The best way to board the multiplace raft is to grasp the boarding handle, kick feet vigorously while pulling elbows and lifevest over the raft tube. Then grasp the inboard boarding handle, and pull and roll the body into the raft. Another way of boarding the raft is illustrated in figure 15-18. This method is more satisfactory when boarding the LR-1 liferaft. Boarding by going over the end rather than the side, lessens the possibility of capsizing the raft.

If the raft should capsize, it is best to approach it from the side on which the CO_2 cylinder is installed. The survivor reaches across the raft and grasps the righting handle farthest from the cylinder. Then, by sliding back into the water and pulling on the righting handle at the same time, the raft will turn right side up. By this method, there will be no chance of the CO_2 cylinder hitting the survivor when he rights the raft. (See fig. 15-19.)

Another important point to remember in righting the raft is to note the surface winds and take advantage of them. It is very hard to right a raft against the wind.

Safety Precautions in Boarding Rafts

Extreme care should be taken when boarding rafts or assisting personnel into the raft from

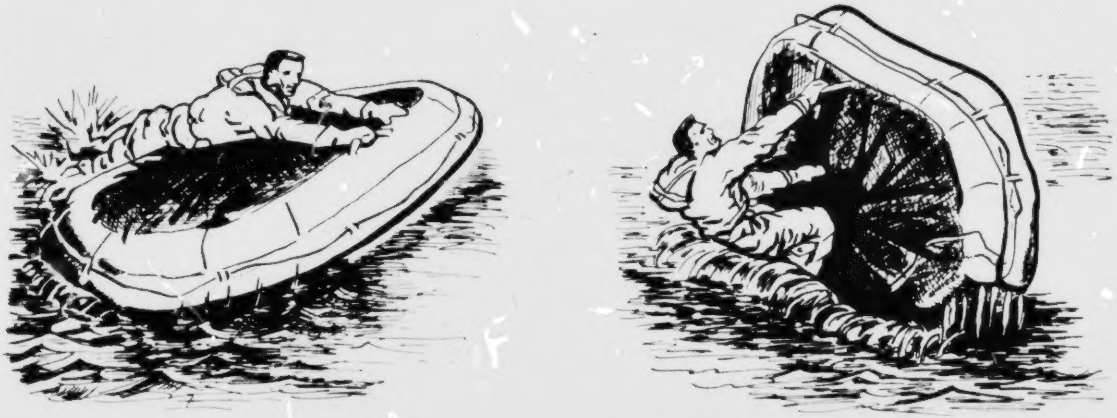

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Figure 15-19.—Righting a capsized raft.

the water. This is particularly so if such persons are wearing parachute harness or lifevests. Once in a raft, all personnel should seat themselves on the floor and remain in that position if at all possible. Movement within the raft should be restricted as much as possible to keep friction at a minimum. All sharp objects should be collected and stored, especially jeweled rings, wrist watches, etc. All loose articles of equipment should be properly packaged to protect the raft fabric.

ONE MAN LIFERAFTS

The LR-1 liferaft assembly supersedes and replaces all PK and PR series one man liferafts. All PK and PR liferafts currently in use must be modified in accordance with the instructions contained in NavAir 13-1-6.1.

LR-1 LIFERAFT ASSEMBLY

The LR-1 liferaft assembly consists of an inflation assembly (carbon dioxide cylinder and inflation valve), and a one man liferaft; three types of carbon dioxide cylinders and three types of inflation valves are approved for service use.

The raft consists of a single compartment flotation tube with a noninflatable floor. It is blue in color (when initially procured) and features a weathershield, sea anchor, sea anchor pocket, and a retaining line pocket. The weathershield is nonspecular sea blue in color on the outside and bright red on the inside. In addition, a directive compliance patch and an inspection record patch are included for record keeping. The various applications of the LR-1 liferaft are contained in NavAir 13-1-6.1.

Emergency survival equipment (when used) is secured to the raft by either a securing line or a drop line, as applicable. The packaged configuration of an LR-1 liferaft assembly, including survival items, will vary according to application.

To make up a packaged assembly, the required components must be individually requisitioned, unless otherwise specified.

The LR-1 liferaft assembly is inflated either manually by pulling the inflation assembly actuating lanyard, or automatically on the LR-1 (RSSK) by gravity drop on the kit actuation. The inflation assembly inflates the flotation tube. After boarding the raft, the LR-1 may be topped off by using the oral inflation valve.

This section will describe the components of the LR-1, the survival equipment, and the procedures for performing inspections and maintenance. Procedures which parallel those already outlined for multiplace rafts are not repeated.

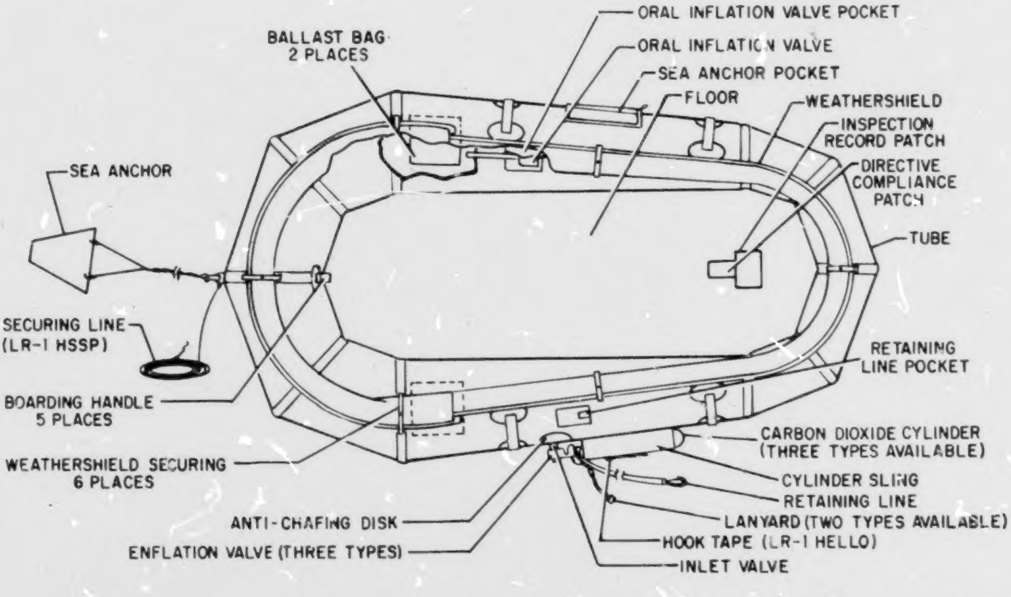
ORAL INFLATION VALVE POCKET
BALLAST BAG 2 PLACES
ORAL INFLATION VALVE
SEA ANCHOR POCKET
FLOOR
WEATHERSHIELD
INSPECTION RECORD PATCH
SEA ANCHOR
DIRECTIVE COMPLIANCE PATCH
TUBE
SECURING LINE (LR-1 HSSP)
RETAINING LINE POCKET
BOARDING HANDLE 5 PLACES
CARBON DIOXIDE CYLINDER (THREE TYPES AVAILABLE)
WEATHERSHIELD SECURING 6 PLACES
CYLINDER SLING
RETAINING LINE
ANTI-CHAFING DISK
LANYARD (TWO TYPES AVAILABLE)
HOOK TAPE (LR-1 HELLO)
ENFLATION VALVE (THREE TYPES)
INLET VALVE

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Figure 15-20.—LR-1 liferaft assembly.

Flotation Tube

The body of the raft consists of an encircling tube which is made in one continuous chamber. There are no internal bulkheads as in the multiplace rafts. Various attachments and configurations of the flotation tube are shown in figure 15-20.

Oral Inflation Tube

The valve on the oral inflation tube closes automatically by spring pressure when it is not held open. The valve is locked shut by turning the mouthpiece in a clockwise direction. The 3/8-inch oral inflation tube is cemented to the valve at one end, and at the other end it is equipped with a molded flange which is cemented to the flotation tube.

Boarding Handles

Five handles are provided as aids for boarding the raft.

Ballast Bags

Ballast bags, installed at two locations, are required to increase the raft stability, to prevent the raft from becoming airborne during helicopter pickup, and to aid in boarding the raft.

Weathershield

The weathershield is used to protect the raft occupant from adverse ambient weather.

Sea Anchor

The sea anchor is used to retard the inflated raft from drifting. The sea anchor is tied to the raft mooring line with type III nylon line, using a bowline knot; the other end is tied to the sea anchor mooring patch with a square knot. The bitter ends of both knots are served with nylon thread to prevent them from untying. Before tying the knots, the ends of the nylon line are HEAT FUSED to prevent fraying.

Sea Anchor Pocket

The purpose of the sea anchor pocket is to prevent entanglement of survivors in the sea anchor line during boarding of the raft. Downed aircrewmen should remove the sea anchor from the pocket and cast the anchor adrift immediately after entry into the raft.

Securing Line

The securing line is a 5-foot length of nylon cord. The securing line secures the raft to the raft container, thereby precluding loss of the survival items.

The nylon cord is inserted through the webbing loop on the sea anchor mooring patch and secured with a bowline knot followed by an overhand knot. The free end is secured to the raft container during the raft packing.

Retaining Line

A nylon webbing retaining line 1 inch wide and 6 1/2 feet long is used to secure the raft to the user. One end of the retaining line is equipped with a snaphook. The other end is secured to the CO_2 cylinder neck by passing the end of the retaining line with the loop formed in it around the coupling nut between the raft and the inflation assembly. The end of the line containing the snaphook is then passed through the loop and pulled up tight.

Survival Items

The LR-1 packaged assemblies requiring survival items are equipped with the items listed in table 15-6. These items are packed in either the combination carrying case and equipment container or in the equipment container, as applicable. The remaining space in the container may be used for specialized equipment deemed necessary for specific environmental or geographic conditions, as directed by the Area Commander.

Reference should be made to NavAir 13-1-6.1 for information concerning which type of packaged LR-1 liferaft assemblies is used onboard certain types of aircraft.

Table 15-6.—LR-1 survival item requirements.

Survival Item	Quantity required
Dye marker	2
Distress signal, MK-13 Mod 0	2
Survival beacon[1]	1
Code card	1
Canned water, 10 oz. (Can Opener) or 1 desalter kit[3]	1
Nylon cord, Type I (50 feet)	1
SEEK-2 or SRU-31 kit	1
Bailing sponge	1
Space blanket, lightweight[2]	1
Additional canned water, 10 oz.	1

[1] If stock levels dictate the type of survival radio to be used, such will be directed by the Area Commander. Until additional instructions are promulgated, the AN/URT-33 beacon should be installed in the equipment container of the appropriate LR-1 liferaft package configuration.

[2] Optional, as space permits.

[3] All desalter kits manufactured prior to 1961 are overaged; do not use. Kits manufactured after 1961 have an indefinite service life unless they have been damaged.

INSPECTION

During the liferaft inspection phase and prior to starting any packing procedures, the liferaft must be updated and modifications incorporated if required. Compare the liferaft assembly configuration with the applicable type raft modifications listed in NavAir 13-1-6.1.

All pararaft assemblies are subjected to a calendar inspection upon issue and at intervals which coincide with the aircraft inspection cycle. However, the interval between calendar inspections must not exceed 30 weeks.

The procedure for inspecting and testing the pararaft are generally the same as those given earlier in this chapter for the multiplace liferaft. Additionally, reference should be made to NavAir 13-1-6.1. Where there are considerable differences in their construction, certain steps may be eliminated or added as necessary. For example, pararafts are not constructed with

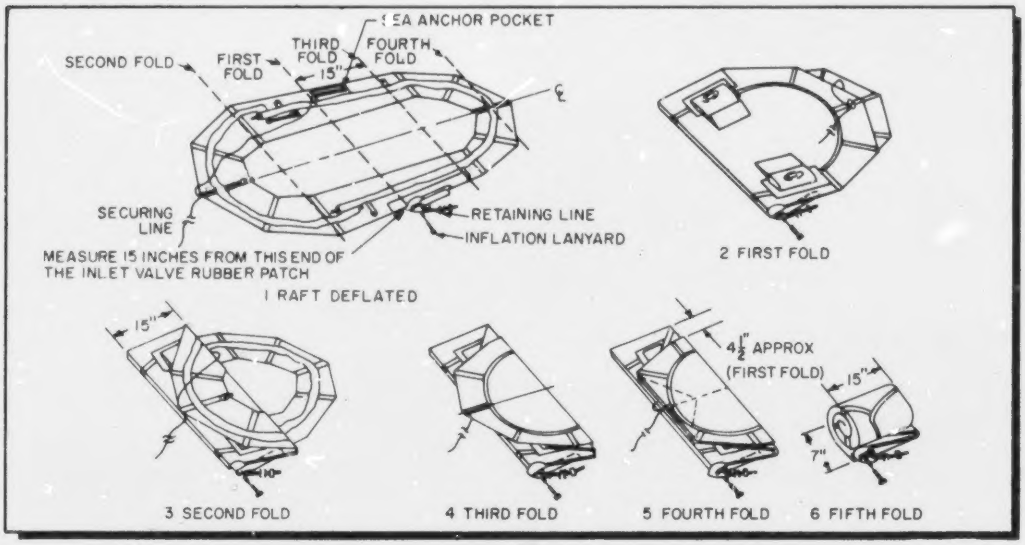
SEA ANCHOR POCKET
SECOND FOLD
FIRST FOLD
THIRD FOLD
FOURTH FOLD
15"
℄
SECURING LINE
RETAINING LINE
INFLATION LANYARD
MEASURE 15 INCHES FROM THIS END OF THE INLET VALVE RUBBER PATCH
1 RAFT DEFLATED
2 FIRST FOLD
15"
3 SECOND FOLD
4 THIRD FOLD
4½" APPROX (FIRST FOLD)
15"
7"
5 FOURTH FOLD
6 FIFTH FOLD

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Figure 15-21.—Folding the LR-1 for standard, special, and high speed soft packs.

internal bulkheads. Since there is only one continuous flotation tube, the internal bulkhead test is not necessary on the pararaft. The pararaft is fitted with an oral inflation tube, but it serves the same purpose as the multiplace raft topping-off valves. Therefore, the same general considerations given the topping-off should be applied to the oral inflation tube. Although the exposed end of the oral inflation tube has no rough edges, it is kept in a supporting pocket.

PACKING

This section contains information on packing the LR-1 liferaft in the combination carrying case and equipment container (used in standard and special soft packs), high speed soft pack, high speed soft pack (modified), and the helicopter back pack. Information on packing the LR-1 liferafts used in RSSK's is covered in chapter 19 of this manual.

To pack an LR-1 liferaft in a combination carrying case and equipment container, proceed as follows:

1. Insure that the raft, combination carrying case and equipment container and, if present, the outer container have been inspected.
2. Lightly dust the entire raft assembly with talcum powder.
3. If necessary, stow the sea anchor and/or weathershield.
4. On the LR-1 special with a Navy FLU-6/P inflation valve installed, pass the end of the retaining line containing the loop around the inflation valve at the cylinder neck. Pass the end of the line containing the snaphook through the loop and pull the line tight.
5. On the LR-1 having the MIL-V-25492, Type 2, Design II inflation valve installed, pass the end of the retaining line containing the loop around the coupling nut between the raft and the inflation assembly. Pass the end of the line with the snaphook through the loop and pull the line tight.
6. Fold the anti-chafing disk around the inflation valve. Insure that the oral inflation valve is locked.
7. Fold the raft in accordance with figure 15-21.

8. Place the raft in the RAFT compartment so that the carbon dioxide cylinder is forward and the inflation valve is positioned as directed.

9. Fake the webbing retaining line across the top of the cylinder so that the snaphook exits at the inflation valve side of the container.

10. Tie the securing line to the eyelet located on the lower flap on the combination carrying case and equipment container. Stow the excess securing line inside the container.

11. On the LR-1 Special with MIL-V-25492, Type 2, Design II inflation valve, and the LR-1 SSP, snap the raft compartment of the combination carrying case and equipment container closed. The inflation toggle must protrude through the opening in the case at the red webbing. The webbing retaining line must exit between the closely spaced snap fasteners.

12. On the LR-1 Special with Navy FLU-6/P inflation valve installed, snap the RAFT compartment of the combination carrying case and equipment container closed. The inflation toggle should be stowed inside the container.

13. Insure that the survival items have been inspected for expiration and damage. Refer to table 15-6 for survival item requirements.

14. Tie the survival items together in train using type I nylon cord; this security is necessary in order to prevent loss of the items.

15. Place the tied survival items in the EQUIPMENT portion of the combination carrying case and equipment container.

16. Close the slide fastener.

17. On the LR-1 SSP, if a standard soft pack outer container is required, insert the combination carrying case and equipment container into the outer container and secure the quick disconnect shackle. Position the handle under the shackle.

18. On the LR-1 Special, insert the combination carrying case and equipment container into the outer container and secure the quick disconnect shackle. Position the handle under the shackle.

For incorporation of the LR-1 SSP with specific parachute assemblies refer to NavAir 13-1-6.2 and chapter 19 of this manual.

Packing The LR-1 Liferaft In The High Speed Soft Pack

To pack an LR-1 liferaft in a high speed soft pack, proceed as follows:

NOTE: The high speed soft pack is normally packed at the same time as its parachute assembly.

1. Insure that the raft, equipment container and outer container have been inspected.

2. Insure that the survival items have been inspected for expiration and damage.

3. Tie the survival items together using type I nylon cord.

NOTE: The metal items must be separated and the signal mirror should be protected.

4. Place the survival items in the EQUIPMENT container.

5. Close the equipment container slide fastener.

6. Lightly dust the entire raft assembly with talcum powder.

7. If necessary, stow the sea anchor and/or weathershield.

8. On the MIL-V-24492, Type 2, Design II inflation valve, pass the end of the retaining line with the loop around the coupling nut between the raft and inflation assembly. Pass the end of the line containing the snaphook through the loop and pull the line tight. On the Navy FLU-6/P inflation valve, pass the end of the retaining line with the loop around the inflation valve at the cylinder neck. Pass the end of the line containing the snaphook through the loop and pull tight.

9. Fold the anti-chafing disk around the inflation valve. Insure that the oral inflation is locked.

10. Fold the raft in accordance with figure 15-21.

11. Tie the raft securing line to the loop on the EQUIPMENT container using bowline knots.

12. Place the EQUIPMENT container into the outer container.

13. Place the raft into the outer container so that the carbon dioxide cylinder is toward the opening and the inflation valve is at the end opposite the ripcord handle pocket.

14. Fake the webbing retaining line across the top of the cylinder. Attach the snap fastener to the mating fastener on the flap at the ripcord end of the outer container.

15. Pull the locking cone side flap over the raft. Pull the grommet side flap over the locking cone flap.

16. Place the tab on the end flap with the ripcord handle pocket between the two side flaps and over the locking cone. Place the grommet over the cone and insert the ripcord pin nearest the handle.

17. Insert the center ripcord pin in the center locking cone.

18. Secure the last locking cone in the same manner as discussed in step 15.

19. By using a fid, tuck the end flaps into the container.

20. Insert the ripcord handle into the pocket and press any excess cable into the pocket. Do not kink the ripcord cable.

NOTE: The tab on the webbing retaining line should be the only part of the retaining line that is visible.

21. Safety tie the first and third ripcord pins using one turn of unwaxed size A nylon thread, single. Tie the pins with 3 or 4 half hitches.

22. Safety tie the ripcord handle in its pocket using one turn of unwaxed size A nylon thread, single. Tie the ends with a surgeon's knot followed by a square knot.

23. Close the ripcord protector flap.

Packing The LR-1 Liferaft In The High Speed Soft Pack (Modified)

To pack an LR-1 liferaft in a high speed soft pack (modified), proceed as follows:

1. Insure that the raft and outer container have been inspected.

2. Lightly dust the entire raft assembly with talcum powder.

3. If necessary, stow the sea anchor and/or weathershield.

4. Pass the end of the retaining line with the loop around the coupling nut between the raft and inflation assembly. Pass the end of the line with the snaphook through the loop and pull the line tight.

5. Fold the anti-chafing disk around the inflation valve. Insure that the oral inflation valve is locked.

6. Fold the raft in accordance with figure 15-22.

7. Place the raft into the outer container so that the carbon dioxide cylinder is toward the opening and the inflation valve is at the end opposite the ripcord handle pocket.

8. Fake the webbing retaining line across the top of the cylinder. Attach the snap fastener to its mating fastener located on the flap on the ripcord end of the outer container.

9. Mate the hook tape on the cylinder sling with the pile tape on the locking cone flap.

10. Pull the grommet side flap over the locking cone flap.

11. Place the tab on the end flap with the ripcord handle pocket between the two side flaps and over the locking cone. Place the grommet over the cone and insert the ripcord pin nearest the handle.

12. Insert the center ripcord pin in the center locking cone.

13. Secure the last locking cone in the same manner as discussed in step 10.

14. Using a fid, tuck the end flaps into the container.

15. Insert the ripcord handle into the pocket and press any excess cable into the pocket. Do not kink the ripcord cable.

16. Safety tie the first and third ripcord pins using one turn of unwaxed size A nylon thread, single. Tie the thread to the ripcord with three or four half hitches.

17. Safety tie the ripcord handle in its pocket using one turn of unwaxed size A nylon thread, single. Tie the ends with a surgeon's knot followed by a square knot.

18. Close the ripcord protector flap.

Packing The LR-1 Liferaft In The Helicopter Back Pack

To pack an LR-1 liferaft in a helicopter back pack, proceed as follows:

1. Insure that the raft and carrying case have been inspected.

2. Lightly dust the entire raft assembly with talcum powder.

3. If necessary, stow the sea anchor.

4. Deploy the weathershield and lay it out neatly over the top of the raft.

5. On the MIL-V-25492, Type 2, Design II inflation valve, pass the end of the retaining line with the loop around the coupling nut between the raft and inflation assembly. Pass the end of the lines with the snaphook through the loop and pull the line tight. On the Navy FLU-6/P

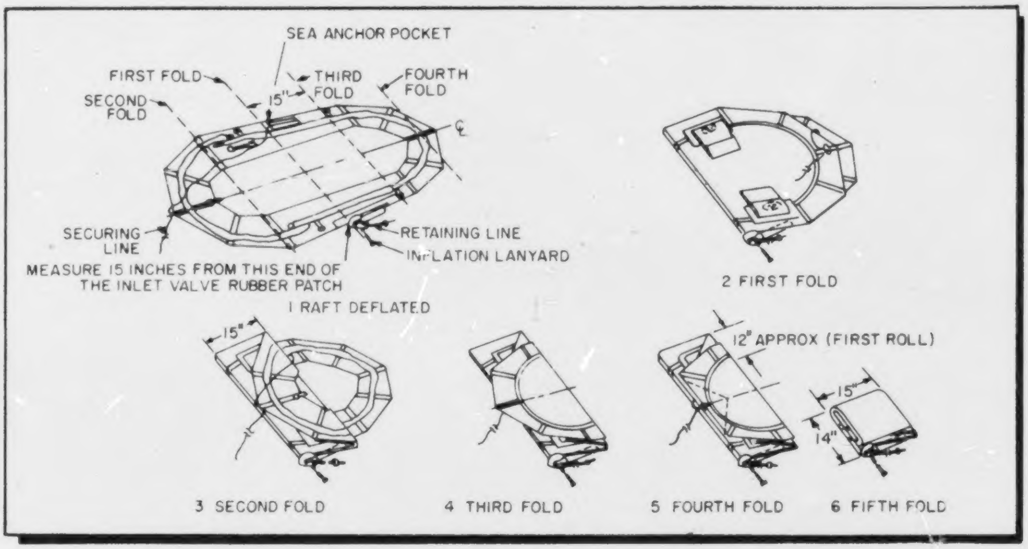
SEA ANCHOR POCKET
FIRST FOLD
THIRD FOLD
FOURTH FOLD
SECOND FOLD
15"
℄
SECURING LINE
RETAINING LINE
INFLATION LANYARD
MEASURE 15 INCHES FROM THIS END OF THE INLET VALVE RUBBER PATCH
1 RAFT DEFLATED
2 FIRST FOLD
15"
12" APPROX (FIRST ROLL)
15"
14"
3 SECOND FOLD
4 THIRD FOLD
5 FOURTH FOLD
6 FIFTH FOLD

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Figure 15-22.—Folding the LR-1 for high speed soft pack (modified).

inflation valve, pass the end of the retaining line with the loop around the inflation valve at the cylinder neck. Pass the end of the line with the snaphook through the loop and pull tight.

6. Fold the anti-chafing disk around the inflation valve. Insure that the oral inflation valve is locked.

7. Fold the raft in accordance with figure 15-23.

8. Place the carrying case on a table so that the panels are open and the inside of the case is facing up.

9. Place the folded raft on the carrying case back panel so that the inflation valve toggle is toward the case centerline.

10. Fake the webbing retaining line in bights of approximately 6 inches. Secure the bights with a rubber band and stow it under the carbon dioxide cylinder. Secure the snap fastener on the end of the retaining line to its mating fastener on the lower end of the back panel.

11. Mate the hook tape on the cylinder sling with the pile tape on the lower flap.

12. Place the protective flaps over the raft.

13. Fold the top panel over the back panel of the raft and secure the snap fasteners.

LRU-7/P LIFERAFT ASSEMBLY

The LRU-7/P liferaft system is a one man inflatable flotation assembly that is designed for attachment to the SP-1A Seat Pan and the NS-3 Parachute.

The system consists of a simplified one man liferaft (LRU-7/P), a static line type release mechanism, and a special container with tabs for attachment to the parachute and seat pan. The LRU-7/P liferaft is a single compartment flotation tube with a noninflatable floor. The raft is equipped with two permanently attached ballast bags, two boarding handles, and a sea anchor. The inflation system for the LRU-7/P consists of a carbon dioxide cylinder equipped with an inflation valve conforming to MIL-V-25492, Type 2, Design II. Although simplified in its construction, the LRU-7/P is comparable to the standard Navy one man liferaft except it contains no survival items.

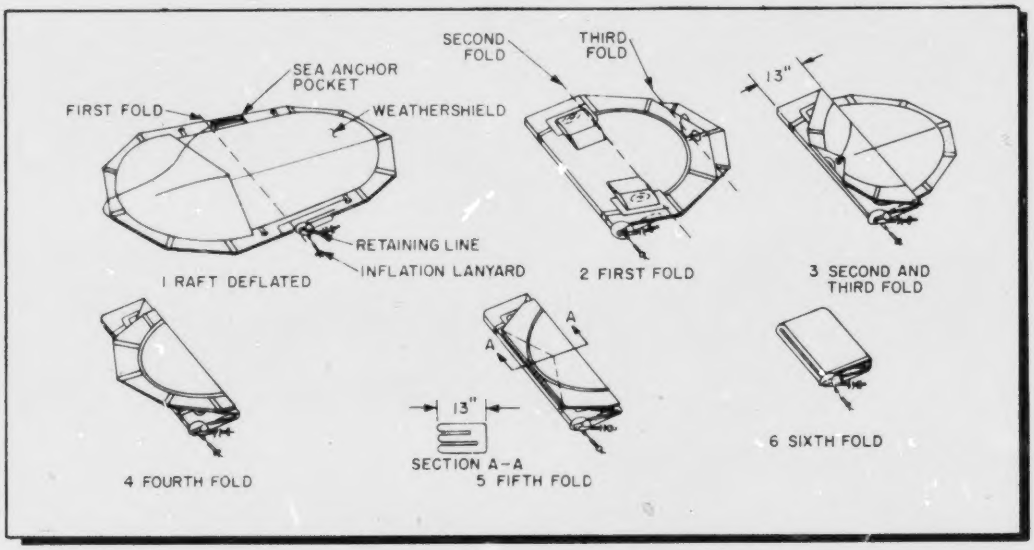
SECOND FOLD
THIRD FOLD
SEA ANCHOR POCKET
FIRST FOLD
WEATHERSHIELD
13"
RETAINING LINE
INFLATION LANYARD
1 RAFT DEFLATED
2 FIRST FOLD
3 SECOND AND THIRD FOLD
A
A
13"
SECTION A–A
4 FOURTH FOLD
5 FIFTH FOLD
6 SIXTH FOLD

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Figure 15-23.—Folding the LR-1 for helicopter back pack.

The liferaft assembly is equipped with a retaining lanyard and snaphook for attachment of the raft to the front D-ring on the LPA-1 life preserver.

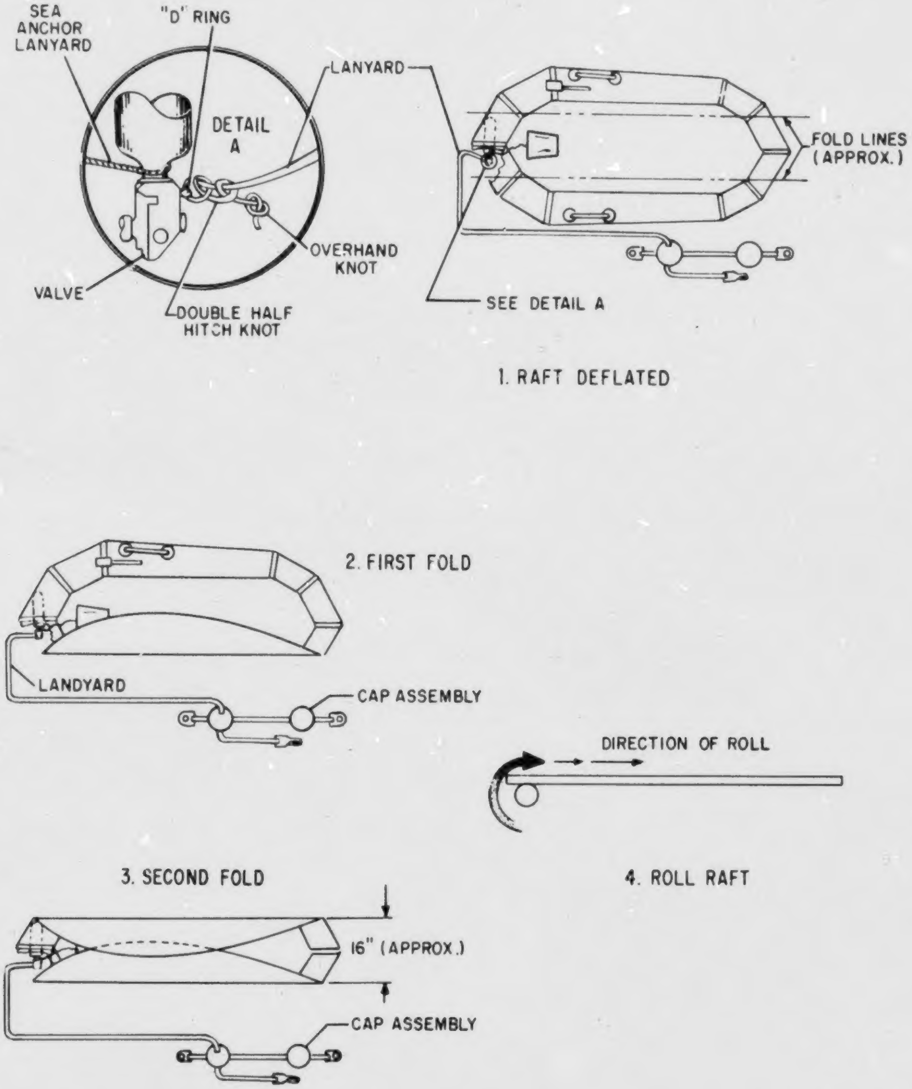
The raft to preserver hookup should be made prior to attaching the lap belt. The lap belt should pass over the raft lanyard. Release of the raft from its container is accomplished by pulling the release cable handle, which should be located in the small of the back during parachute descent. Since the LRU-7/P liferaft assembly is attached to the seat pan and parachute through the raft container, the raft must be released during parachute descent to avoid complications after water entry. Once free of the container, the raft can be actuated by tracing the lanyard to the carbon dioxide cylinder valve. Actuation and raft inflation are accomplished by pulling the lanyard while holding the carbon dioxide cylinder.

The LRU-7/P hangs behind the pilot's knees and is attached to the seat pan and parachute. Installation of the LRU-7/P liferaft system is mandatory on all manned flights in the QT-33A aircraft.

Packing Procedures For The LRU-7/P Liferaft Assembly

To pack a LRU-7/P liferaft assembly proceed as follows:

1. Insure that the raft and container is inspected.
2. Lightly dust the entire raft assembly with talcum powder.
3. If necessary, fake the sea anchor mooring line and inflation lanyard. Hold them in place with rubber bands.
4. Secure the lanyard to the inflation valve D-ring and fold the anti-chafing disk around the inflation valve. Insure that the oral inflation valve is locked and stowed in its pocket.
5. Fold the raft in accordance with figure 15-24.
6. Install the cap assembly over the ends of the rolled raft and place it on the container.
7. Pull the locking cone side of the container over the raft and place the end tab over the locking cones.


SEA ANCHOR LANYARD
"D" RING
DETAIL A
LANYARD
FOLD LINES (APPROX.)
VALVE
OVERHAND KNOT
DOUBLE HALF HITCH KNOT
SEE DETAIL A
1. RAFT DEFLATED
2. FIRST FOLD
LANDYARD
CAP ASSEMBLY
DIRECTION OF ROLL
3. SECOND FOLD
4. ROLL RAFT
16" (APPROX.)
CAP ASSEMBLY

PR.357

Figure 15-24.—Folding the LRU-7/P liferaft.

8. Pull the grommet side of the container over the locking cones and install the ripcord pins.

NOTE: The ripcord protector flap should be left in the open position until the raft is attached to the seat pan and the ripcord cable is installed.

CHAPTER 16

CARBON DIOXIDE

Carbon dioxide is a component of the atmosphere. It is formed in the process of respiration, in combustion of all carbonaceous material, and in fermentation.

CO_2 (the chemical symbol for carbon dioxide) is a colorless gas, possessing a faint pungent odor and a slightly acid taste. It does not burn and does not ordinarily support combustion. However, metals such as magnesium, when ignited, will continue to burn in it while giving off oxides and liberating carbon. CO_2 gas is 1.53 times heavier than air and requires only a pressure of 600 psi below a temperature of 88° F to liquefy. It can be condensed into a colorless liquid and stored in this state under pressure in cylinders. When the cylinder valve is opened, gaseous CO_2 escapes and, because of the rapid drop in pressure and temperature, forms carbon dioxide snow. This snow, when compressed into blocks or cubes, is what we know as dry ice. Dry ice, in solid form and at atmospheric pressure (14.7 psi), evaporates, remaining at -110° F until it disappears. It is excellent for specialized refrigeration.

There are many natural carbon dioxide wells in the earth's surface. Yellowstone National Park has several of these wells. In some caves the CO_2 is so dense that animals are suffocated when they wander into them. Since CO_2, in addition to being heavier than air, is both invisible and practically odorless, it presents a particular hazard. As in caves, it tends to collect in low, unventilated places, such as below decks aboard ship. Men encountering these conditions run the risk of smothering to death. Small percentages of carbon dioxide will cause tiredness and perhaps headaches. Experiments have shown that a 3 percent concentration of CO_2 in the air will double the breathing effort, 5 percent will cause panting, 8 percent will cause marked distress, and 10 percent will cause unconsciousness very quickly.

Treatment of exposed personnel includes removal from the CO_2 laden atmosphere, artificial resuscitation, administering oxygen, and keeping the patient warm.

The PR's association with carbon dioxide is mainly in the recharging of cylinders used in the inflation of liferafts. The servicing of the CO_2 firefighting equipment commonly used at shore establishments and aboard ship is not a part of the PR's duties.

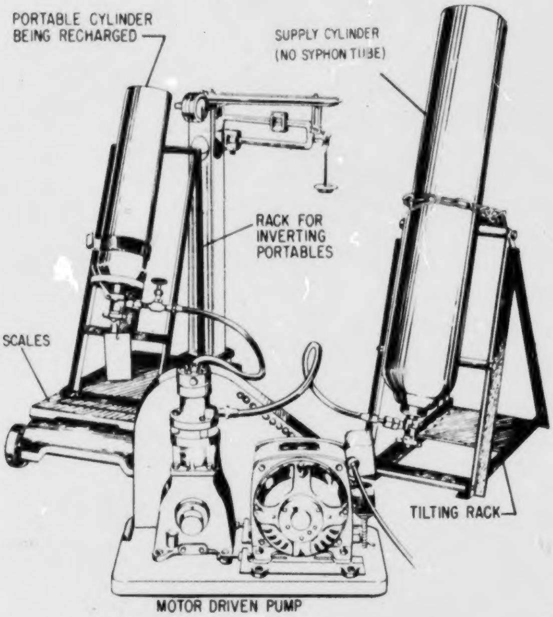
Carbon dioxide is ordinarily procured from local commercial sources. In some locations the Navy manufactures its own. CO_2 is purchased or accounted for by the pound, since it is measured in a liquid state. Gas (CO_2 not in a liquid state) is measured on a volume basis and purchased by the cubic foot.

Standard supply cylinders are designed to contain 50 pounds of carbon dioxide and are procured through normal supply procedures. As an example, an order for 300 pounds of CO_2 would indicate a request for 6 supply cylinders.

CO_2 RECHARGE EQUIPMENT

Carbon dioxide recharge equipment is manufactured for the Navy by several different companies. The two most widely used units are those manufactured by the C-O-TWO Company of Newark, New Jersey, and the Walter Kidde Company of Belleville, New Jersey.

A typical C-O-TWO recharge unit is shown in figure 16-1 and consists of a supply cylinder containing 50 pounds of CO_2, a tilting rack for inverting the supply cylinder, a motor-driven pump, a rack for inverting the cylinder being recharged, a scale for determining the weight of the cylinder being recharged, and the necessary high-pressure hoses, control valves, adapters, etc., to properly hook up the equipment.


PORTABLE CYLINDER BEING RECHARGED
SUPPLY CYLINDER (NO SYPHON TUBE)
RACK FOR INVERTING PORTABLES
SCALES
TILTING RACK
MOTOR DRIVEN PUMP

PR.39

Figure 16-1.—C-O-TWO recharge or transfer unit (supply cylinder without a syphon tube).

Before learning the operation of any specific type of recharge equipment, the PR should be familiar with the following general information, which applies to all units.

Carbon dioxide recharge equipment will pump CO_2 in its liquid state only, and the amount of liquid CO_2 a cylinder contains will vary with the temperature and pressure. For example, a standard 50-pound supply cylinder contains approximately 38 pounds of liquid CO_2 and 12 pounds of gaseous CO_2 at a temperature of 70° F. It follows, then, that the cooler the supply cylinder and cylinder being recharged, the more efficient the operation of the transfer equipment. For this same reason, the time required to recharge an empty cylinder increases with the temperature of the cylinders.

When recharging a cylinder, it will remain cooler and may be filled faster if inverted, rather than left in an upright position. Large cylinders, which are impractical to invert, may be placed in a horizontal position for charging.

Standard commercial supply cylinders in 50-pound sizes are obtained with or without a syphon tube. When transferring from a cylinder without a syphon tube, the cylinder must be inverted. Supply cylinders with syphon tubes should be maintained in an upright position, not more than 60 degrees from vertical.

After all the liquid CO_2 has been transferred from a supply cylinder (approximately 80 percent of net contents), the efficient transfer of CO_2 will cease. Then, a new fully charged supply cylinder must be used to finish charging a cylinder to its fully rated capacity. The major part of the CO_2 remaining in the supply cylinder can be used when recharging another empty cylinder, as the CO_2 gas will transfer itself under its own pressure until the pressure in both cylinders is equal. In this manner, the most economical use of the supply cylinder contents is made.

C-O-TWO TRANSFER UNIT

The general procedures for operating the C-O-TWO unit shown in figure 16-1 is described later in this chapter. For more complete details on erection, operation, and maintenance of the unit, refer to Operation and Maintenance C-O-TWO Transfer Unit, NavAir 19-1-616.

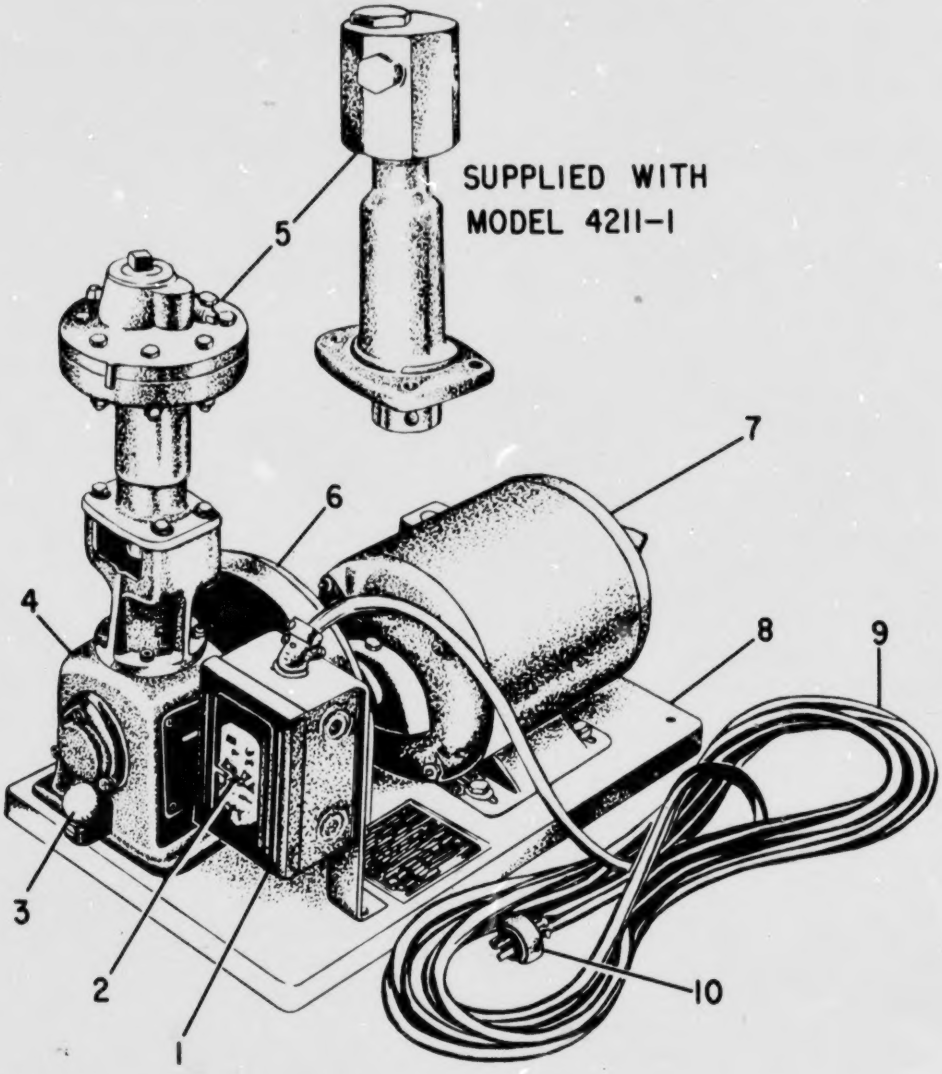
WALTER KIDDE RECHARGE UNIT

Another widely used CO_2 recharge unit is the Walter Kidde (fig. 16-2). This unit is supplied complete with the necessary adapters, valves, safety disks and bushings, nuts, bolts, and washers for making connections to the cylinder to be recharged; connections to the supply cylinder; and the tools for making minor adjustments to the unit. The motor is equipped with a safety switch.

For operating instructions on recharging specific types of cylinders, refer to Operation and Maintenance Kidde CO_2 Recharge Pump, NavAir 19-1-501.

CO_2 SUPPLY CYLINDERS

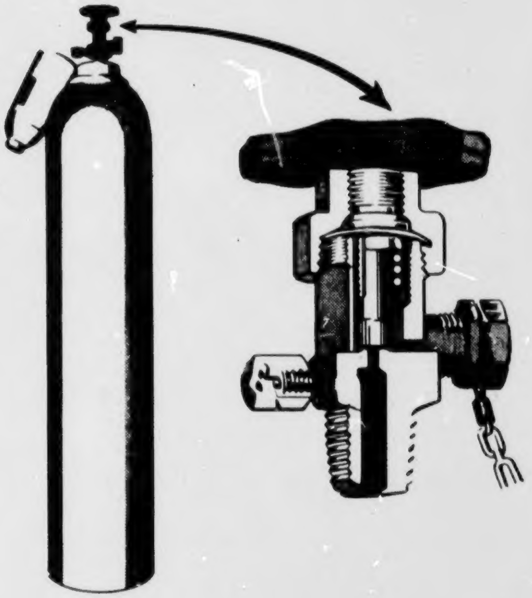
Figure 16-3 illustrates the standard supply cylinder used universally in recharging various


SUPPLIED WITH
MODEL 4211-1
5
7
6
4
8
9
3
2
10
1

1. Multibreaker.
2. Power switch.
3. Oil filler cap.
4. Running gear assembly.
5. Compressor assembly.
6. Gear guard.
7. Motor.
8. Base.
9. Power cable.
10. Three-prong plug.

PR.364

Figure 16-2.—Walter Kidde recharge unit.



PR.366

Figure 16-3.—CO_2 supply cylinder.

types of CO_2 cylinders. A cutaway view of the cylinder valve is also shown. Table 16-1 lists some of the most pertinent data concerning supply cylinders.

Capacity at normal pressure and temperature*	50 pounds
Working pressure	1,800 to 2,015 psi
ICC specification	ICC3A
Dimensions (approx.)	Diameter, 8 1/2 inches; length, 51 inches
Weight, empty	110 - 115 pounds
Outlet connection	3/4 inch

*Temperature of 68° - 70° F and atmospheric pressure.

NOTE: The U.S. Department of Transportation (DoT) has assumed all of the regulatory functions for compressed gases and gas cylinders that were formerly under the Interstate Commerce Commission (ICC). Reference is made herein to DoT with the understanding that cylinders, labels, and tags now in the system will retain their ICC identification.

For more detailed information concerning gas cylinders, refer to NAVSUPINST 4440.128B (Series).

Cylinder Valves Related To Recharge Equipment

Navy standard valves are of two basic designs: Packed valves and diaphragm type packless valves. CO_2 handwheel type valves employ the packless design.

Packed valves require a packing material around the valve stem to prevent leakage, whereas valves (used mainly in high-pressure cylinders) are sealed against leakage around the valve stem by flexible metallic diaphragms securely clamped to the valve bonnets.

The basic packless design may be classified into two types: (1) the NON-BACK-SEATING type, which is designed so that the metallic sealing diaphragms may NOT be replaced UNDER PRESSURE, and (2) the BACK-SEATING type, in which the metallic diaphragms may be replaced without undue hazard or loss of contained gases, provided the outlet cap is in place and secure. Replacement of diaphragms in packless valves should be done only by activities carrying spare diaphragms specifically designed for the valves in need of reconditioning. Diaphragms are fabricated from materials selected for service at high pressure while dynamically loaded. In addition, they are often of a design suitable only for use with valves fabricated by a given manufacturer and for a specific gas.

One of the features of the Navy gas valve program (also civilian agencies) is to provide noninterchangeable valve outlets and connections for different gases to prevent using the wrong gas at any time.

Leaking Valves

Cylinders with leaking or defective valves must be turned in to supply for overhaul. This is especially true in the case of stripped threads or bent stems.

Leakage is sometimes caused by the presence of dirt or other foreign particles in the valve or on the valve seat. This type leakage may sometimes be corrected by partially opening and then closing the valve to blow out the material. If leakage continues, the cylinder should be removed to a safe place in the open, if possible, and emptied by opening the valve.

SAFETY DEVICES

Safety devices for CO_2 cylinder valves consist of an unbacked safety cap with a rupture disk. It consists essentially of a safety cap covering a safety port in the valve. The cap retains a frangible disk firmly over the safety port. Under excessive pressures ranging from 2,700 to 3,000 psi, the safety disk ruptures and allows the gas in the cylinder to vent to atmosphere.

LIFERAFT INFLATION ASSEMBLY EQUIPMENT

The following sections will cover the various types of liferaft inflation items. These items consists of various discharge heads, inflation assembly valves, cylinders, and maintenance requirements.

DISCHARGE HEADS

Two types of discharge heads are commonly used. These are the cutter type and the seat type. A description of the operating principles of each type follows.

Cutter Type

Pulling a cable releases the cutter which is under spring action. The cutter pierces a sealing disk in the neck of the cylinder. CO_2 discharges through the ruptured disk, bypassing the cutter and passes on through the outlet into the raft inflation compartment. A new disk must be installed in the cylinder adapter after each use. This necessitates the temporary removal of the head or bonnet during the recharging process.

Seat Type

Pulling a cable turns a cam or sheave which actuates a stem and opens a seat, thereby admitting CO_2 into the raft compartment through the outlet of the discharge head. It is not necessary to remove the discharge head for recharging after each use. A disk is not employed.

INFLATION ASSEMBLY VALVES

Inflation assembly valves are many and varied; they are designed, modified, and updated to meet specific requirements in their application with CO_2 cylinders that are used in various liferaft configurations. A partial listing of inflation assembly valves include the Inflation Valve MIL-V-25492, Type 2, Design II, the Inflation Valve Navy FR125A1 Modified for Manual Actuation, and the Inflation Valve Navy FR125A1. These are examples of inflation valves identified with the one man liferaft assemblies. (See fig. 16-4.)

Inflation Assembly Inspection

The inflation assembly inspection consists of the following:

1. Inspection of inflation assembly (charged).
2. Inspection of inflation assembly (discharged).
3. Pull cable proof load test.

To inspect a charged inflation assembly, remove the inflation assembly from the raft.

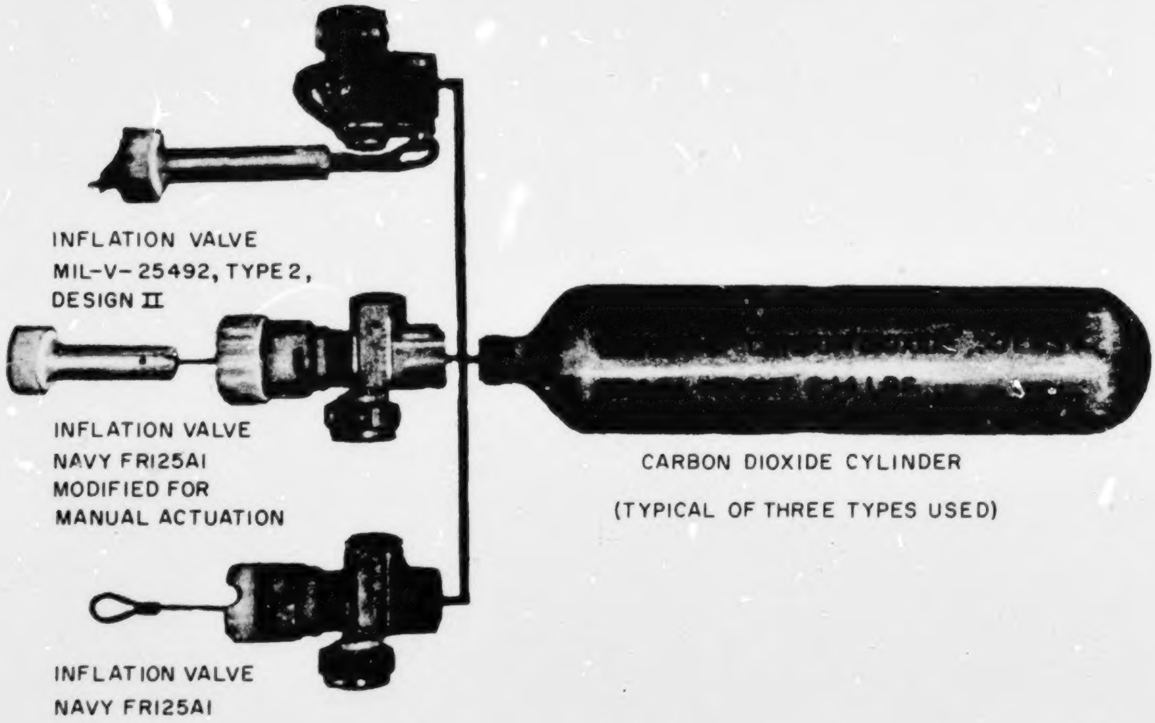
WARNING: Gas under pressure. Do not attempt to remove the valve from the cylinder.

On multiplace rafts only, check the date of last hydrostatic test. If the date is greater than 5 years, discharge and disconnect the cylinder. Obtain a new cylinder from supply as a replacement. Forward the old cylinder to an activity capable of conducting a hydrostatic test.

If it is necessary to replace the cylinder with a satisfactory one, it must be discharged prior to replacement.

Examine the inflation assembly for evidence of corrosion, wear, loose screws, and dents. If damage or extensive wear is found, replace the valve and/or cylinder.

On the LR-1 raft, special with Navy FR125A1 valve modified for manual actuation, insure that the valve cap is cemented to the plastic valve sleeve. Use polychloroprene adhesive (FINN 515-2246) only.


INFLATION VALVE
MIL-V-25492, TYPE 2, DESIGN II
INFLATION VALVE
NAVY FR125A1
MODIFIED FOR
MANUAL ACTUATION
CARBON DIOXIDE CYLINDER
(TYPICAL OF THREE TYPES USED)
INFLATION VALVE
NAVY FR125A1

PR.358

Figure 16-4.—Alternate inflation valve assemblies.

Weigh the inflation assembly and record the gross weight. If the weight indicated on the scales is not the same as the gross weight printed on the cylinder, within the tolerance specified, or if no gross weight is printed on the cylinder, discharge the cylinder and recharge it. For the specific tolerances on CO_2 charge see table 16-2.

To recharge the inflation assembly it will be necessary to set up the recharging equipment as shown in figure 16-5.

Adjust the scales to zero indication, clamp the inflation assembly to the scale weighing pan, and record the tare weight. Close the inflation valve and connect the carbon dioxide fill line and secure it to the work bench. Record the weight of the inflation assembly with the fill line attached.

WARNING: Insure that the carbon dioxide supply valve is turned off and that the compressor is not operating.

Table 16-2.—Carbon dioxide charge.

Raft type	Weight (in lb) of carbon dioxide
LR-1	0.49 to 0.51
LRU-7/P	0.49 to 0.51
MK-4	3.21 to 3.29
MK-7	4.64 to 4.76
MK-12A-1	4.74 to 4.86
MK-20	9.14 to 9.26

NOTE: Do not record the cylinder weight until the scale indicator has stabilized.

Open the carbon dioxide relief valve and open the carbon dioxide supply valve to purge the fill line. Close the relief valve and turn on the compressor. Open the inflation valve, and fill the cylinder until the scale indicates the weight recorded in table 16-2 plus the weight recorded for the inflation assembly with the fill line attached.

Immediately close the inflation valve and shut off the compressor. Close the supply valve, open the relief valve, and disconnect the fill line from the inflation assembly. Read the gross weight, the scale should indicate the weight recorded in table 16-2 plus the weight recorded for the inflation assembly with the fill line attached.

WARNING: Prior to bleeding off any excess carbon dioxide, insure that the inflation assembly is clamped securely to the scale weighing pan.

If the gross weight of the inflation assembly is greater than the weight recorded in table 16-2 plus the weight recorded for the inflation assembly with the fill line attached, bleed off the excess carbon dioxide from the inflation assembly. If the gross weight is less than the combined weights recorded, it will be necessary to repeat the recharging steps.

NOTE: The inflation valve P/N 3208 can be cocked on either of two opposite flats on the cam head. (See fig. 16-6.)

When cocked on one of the flats after recharging, leakage may be possible because of a slightly asymmetrical cam head. After recharging the cylinder, submerge the assembly in water, observe for bubbles from the valve, then dry and store the assembly for 24 hours. After the storage period check the inflation assembly for proper weight. If there is no leakage, return the assembly to service. If leakage has occurred, recharge, recock on the opposite flat, and perform the above test for leakage. If no leakage is found return the assembly to service. If leakage has occurred again, return the valve to supply as beyond capability maintenance (BCM).

For more detailed information concerning inflation assemblies and recharging procedures refer to Aviation-Crew Systems Manual, Inflatable Survival Equipment, NavAir 13-1-6.1.

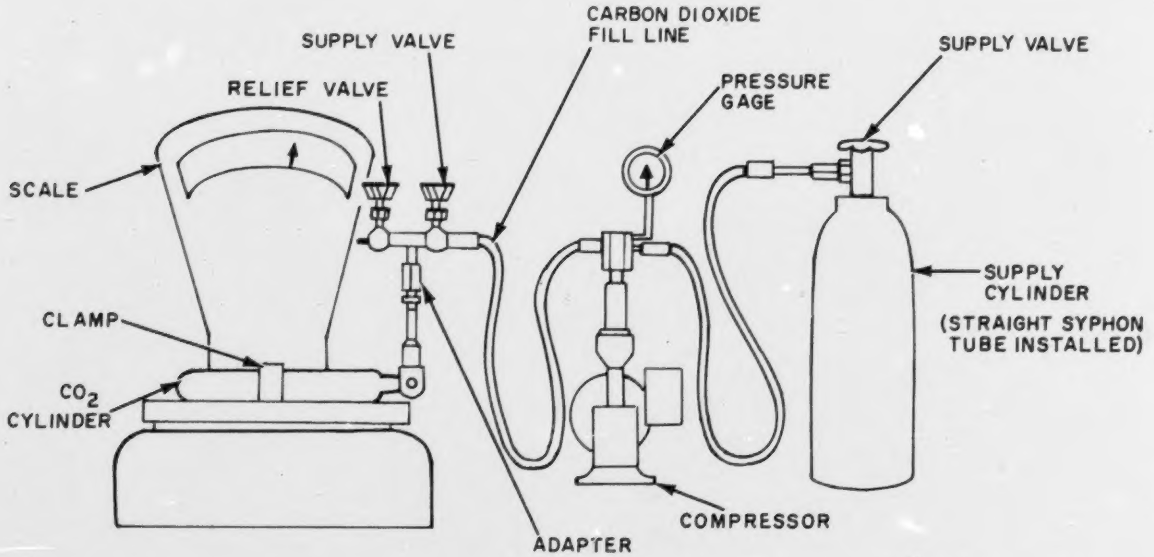
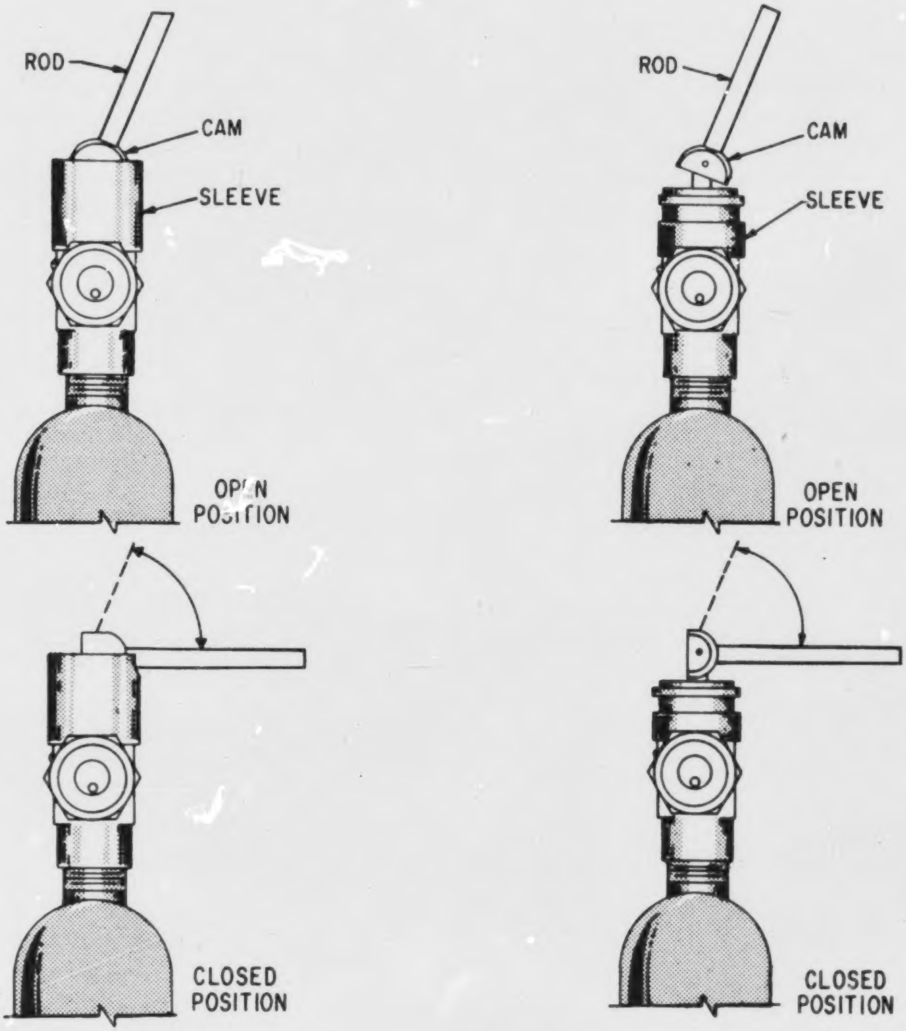


Figure 16-5.—CO_2 recharging schematic.

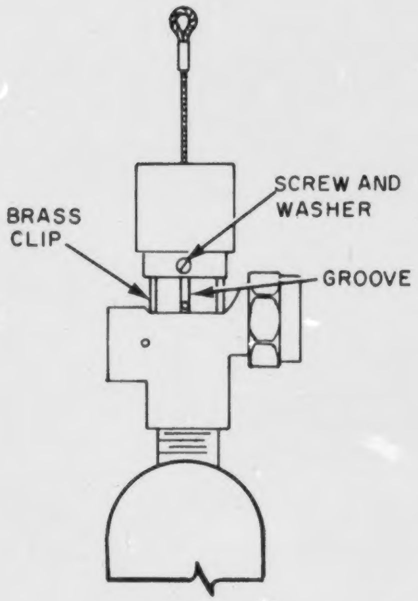

ROD
CAM
SLEEVE
OPEN POSITION
ROD
CAM
SLEEVE
OPEN POSITION
CLOSED POSITION
CLOSED POSITION

PR.360

Figure 16-6.—Inflation valve P/N 3208.

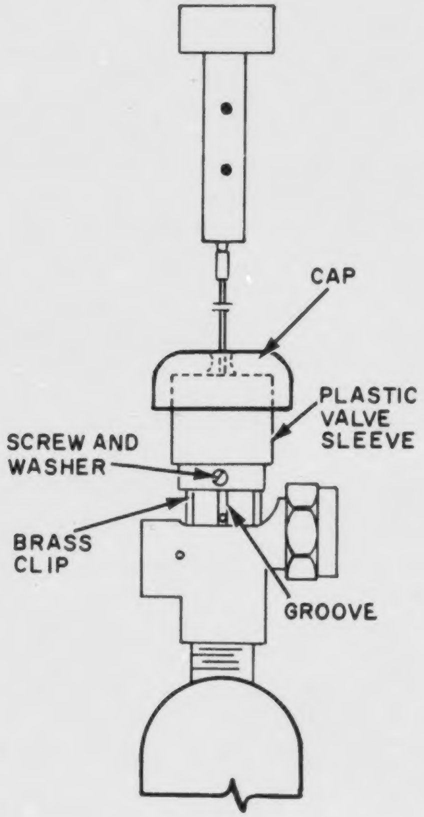
On the LR-1 raft, RSSK, place the ball end of the cable in the hole in the cam. Raise the plastic sleeve and install the brass clip below the plastic sleeve. (See fig. 16-7.)

On the LR-1 raft, special with FR125A1 modified valve, place the ball end of the cable and toggle assembly through the cap and into the hole in the cam. Aline the screw hole in the sleeve with the groove on the valve and slide the sleeve over the cam and onto the valve. Using a paper clip, raise the spring slip lock in the slot on the sleeve and insure that the sleeve is fully seated and raised. Install the screw and washer and install the spring clip below the plastic sleeve. (See fig. 16-8.)



PR.361

Figure 16-7.–LR-1 raft RSSK inflation assembly.



PR.362

Figure 16-8.–LR-1 raft, special with FR125A1 modified valve inflation assembly

NOTE: Insure that the valve cap is cemented to the plastic sleeve. Use polychloroprene adhesive (FINN 515-2246) only.

Immerse the inflation assembly in water, check for leaks, and wipe the inflation assembly dry with a lint-free cloth.

If required, remark or stencil the tare weight, gross weight, and charge weight on the cylinder.

To inspect a discharged inflation assembly, remove the inflation assembly from the raft. Check the date of last hydrostatic test; if greater than 5 years, forward the cylinder to an activity capable of conducting a hydrostatic test and replace with a satisfactory cylinder.

Examine the inflation assembly for evidence of corrosion, wear, loose screws, and dents. If damage or extensive wear is found, replace the valve and/or cylinder.

On the LR-1 raft, RSSK, and the special with Navy FR125A1 valve modified for manual actuation, examine the pull cable for broken strands and loose or defective swage joints. Inspect the plastic parts for cracks and breaks, and inspect the spring clip below the plastic casing for bends, dents, and nicks.

On the LR-1 raft, RSSK, remove the brass clip below the plastic sleeve, using a small paper clip, raise the spring clip lock in the slot on the plastic sleeve and then lower the sleeve.

On the LR-1 raft, RSSK, insert a 0.260 to 0.265-inch diameter metal rod into the hole in the top of the cam. (See fig. 16-6.)

Rotate the cam to open and operate the cam 2 or 3 times, remove the diffuser plug if installed.

On the LR-1 raft, special with Navy FR125A1 modified valve, remove the brass clip below the plastic sleeve. Remove the screw and washer below the sleeve. Insert a 0.260 to 0.265 inch diameter metal rod through the hole in the cap and into the hole in the top of the cam. (See fig. 16-6.)

Using a small paper clip, raise the spring lock in the slot on the plastic sleeve and remove the sleeve and cap. Rotate the cam to open and operate the cam 2 or 3 times. Remove the diffuser plug is installed. Recharge the assembly in the same manner as discussed previously in this chapter.

NOTE: CDI requirements must be performed at specified steps, refer to the applicable Shop Process Card deck.

If necessary, safety-wire the inflation assembly using the required tools and materials as follows:

1. Torque meter
2. Wire, aluminum, QQ-A-225/1, 0.032-inch diameter, temper 0.
3. Wire, brass, QQ-W-321, 0.024-inch diameter, temper 1/8 hard.
4. Seal, lead.
5. Steel pin.
6. Special socket.

On the LR-1 raft, safety-wire the MIL-V-25492, Type II, Design II inflation valve using 0.032-inch diameter aluminum wire and a crimp lead seal, as shown in figure 16-9.

NOTE: The inflation valve, Navy FR125A1, is not safety-wired.

On multiplace rafts, remove the valve cover plate and insure the correct routing of the pull cable. (See fig. 16-10.)

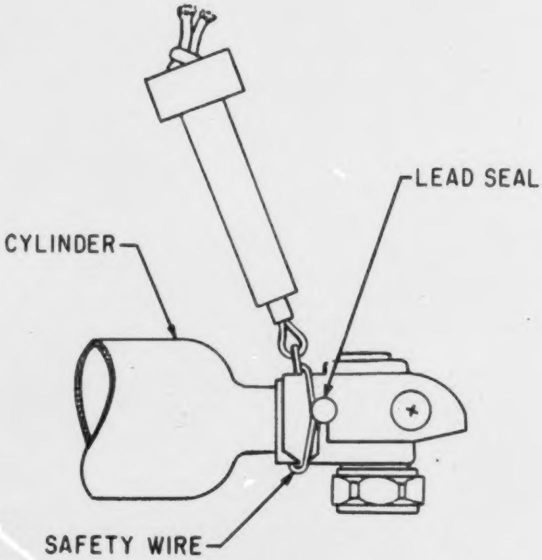
For multiplace rafts, route the safety-wire as shown in figure 16-11, use 0.032-inch diameter aluminum wire.

On the multiplace liferaft, replace the valve cover and twist the ends of the safety-wire to achieve maximum tautness and crimp the lead seal.

Tighten the discharge port to a torque value of 40 to 50 inch-pounds, by using the special socket equipment shown in figure 16-12.

On multiplace rafts safety-wire the pull cable to the pull cable housing as shown in figure 16-13.

Use 0.032-inch diameter aluminum wire on raft inflation assemblies stowed in the wing, fuselage, or nacelle compartments. Use 0.025-inch diameter brass wire on other liferaft inflation assemblies.



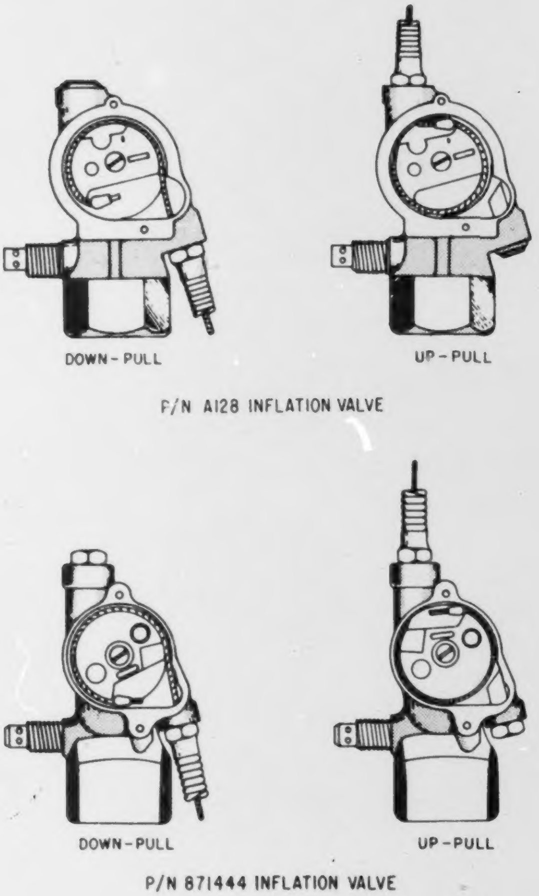
PR.363

Figure 16-9.—Safety wiring the LR-1 raft, MIL-V-25492, Type II, Design II inflation valve.

NOTE: Pull cables on MK-20 liferafts, used in C-130 series aircraft wing compartments, must not be safety-wired. Refer to the applicable aircraft maintenance instructions.

If the inflation assembly is to be withheld from installation temporarily, attach a red tag to the safety-wire. The following instructions must be printed in ink on the tag: WEIGH INFLATION ASSEMBLY BEFORE INSTALLING ON LIFERAFT. DO NOT INSTALL IMPROPERLY CHARGED OR IMPROPERLY SAFETY-WIRED INFLATION VALVE.

If the inflation assembly application is not known, safety wire the inflation assembly remote pull cable with 0.025-inch diameter brass wire. Affix a warning tag to the pull cable hook which reads as follows: WARNING: REMOTE PULL CABLE WIRED WITH 0.025-IN. DIA


DOWN-PULL
UP-PULL
P/N A128 INFLATION VALVE
DOWN-PULL
UP-PULL
P/N 871444 INFLATION VALVE

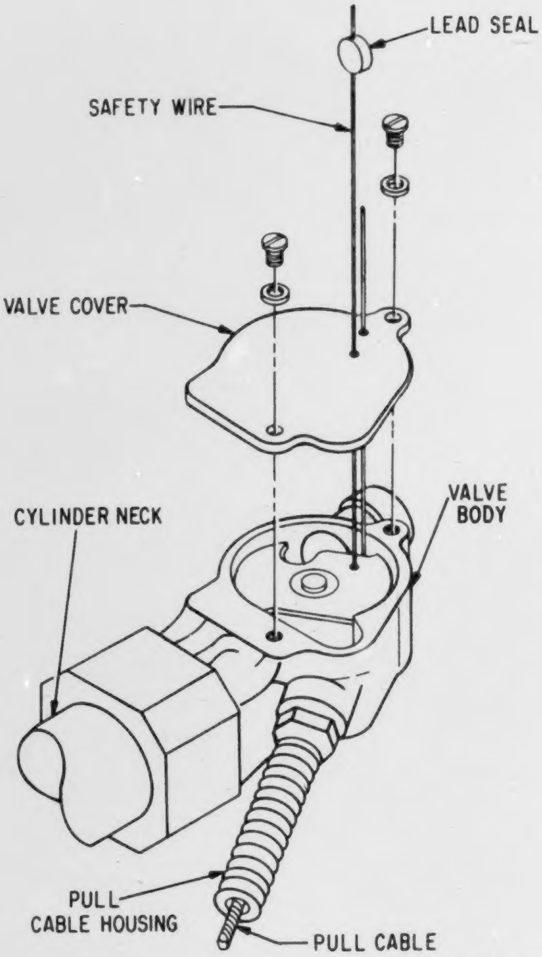
PR.365

Figure 16-10.—Routing of multiplace liferaft inflation valve pull cable.

BRASS WIRE (25 LB). REWIRE WITH 0.032-IN. DIA ALUMINUM WIRE (15 LB) IF RAFT WILL BE USED IN WING, FUSELAGE, OR NACELLE COMPARTMENTS.

To perform the pull cable proof load test for multiplace rafts with remote pull, remove the inflation valve cover plate. Remove the pull cable from the valve and apply a 50-pound pull force between the cable ball and the snaphook.

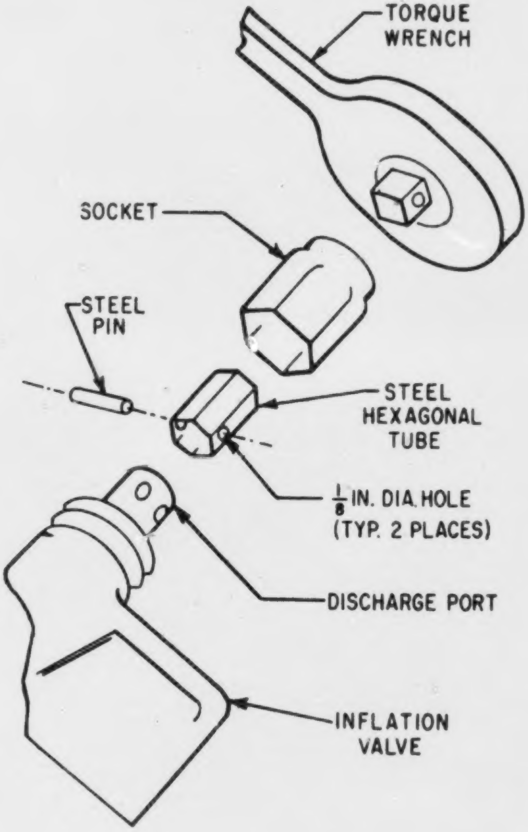
Examine the pull cable for broken strands of wire, deformed snaphook, security of the snaphook spring latch attachment, and loose or


LEAD SEAL
SAFETY WIRE
VALVE COVER
CYLINDER NECK
VALVE BODY
PULL CABLE HOUSING
PULL CABLE

PR.367

Figure 16-11.—Installation of safety-wire for the multiplace liferaft inflation assembly valve.

cracked swage fittings. If any damage is found, the pull cable must be discarded and replaced with a new pull cable. The new pull cable must also be proof load tested in the same manner as discussed previously in this section. If the snaphook spring latch is loose, it may be repaired or replaced at the discretion of the inspecting activity. If the pull cable passes the test, reinstall and safety-wire in the same manner as discussed earlier in this section. Record the date the test


TORQUE WRENCH
SOCKET
STEEL PIN
STEEL HEXAGONAL TUBE
$\frac{1}{8}$ IN. DIA. HOLE (TYP. 2 PLACES)
DISCHARGE PORT
INFLATION VALVE

PR.368

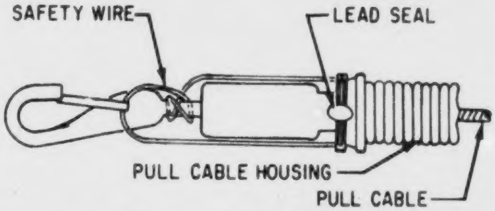
Figure 16-12.—Special socket torque equipment.

was performed in the remarks column of the History Card, NavAir 10470/3.

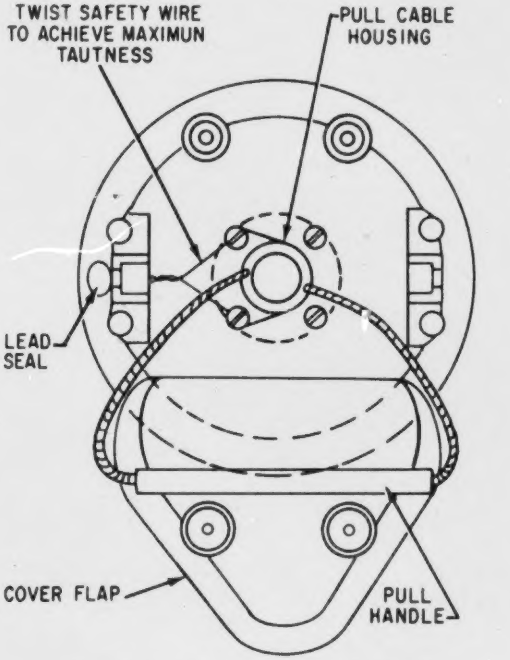
To repair a snaphook spring latch that is found to be loose, remove the pull cable from the inflation assembly, and remove the spring latch from the snaphook. Using soft solder, tin both sides of the spring latch 1/4-inch from the end of the hook. (See fig. 16-14 (A).)

Using soft solder, tin the snaphook as shown in figure 16-14 (B). Reinsert the spring latch into the snaphook and soft solder, securing the spring latch in place. (See fig. 16-14 (C).)

Subject the entire pull cable to a 100-pound pull test after making the snaphook spring latch repair.


SAFETY WIRE
LEAD SEAL
PULL CABLE HOUSING
PULL CABLE

TYPICAL REMOTE PULL CABLE SAFETY WIRING


TWIST SAFETY WIRE TO ACHIEVE MAXIMUN TAUTNESS
PULL CABLE HOUSING
LEAD SEAL
COVER FLAP
PULL HANDLE

LOCAL PULL CABLE SAFETY WIRING

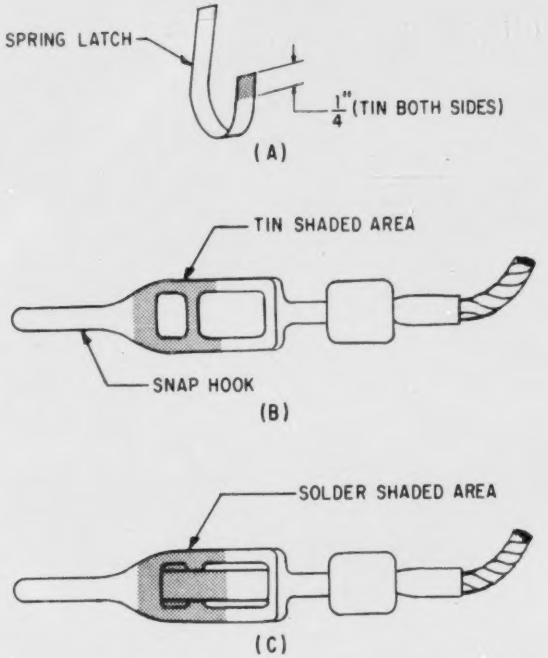
PR.369

Figure 16-13.—Pull cable safety wiring.

LIFERAFT INFLATION ASSEMBLY CYLINDERS

Cylinders, including some of those of new manufacture, continue to bear ICC markings and, until amendment to Department of Transportation (DoT) regulations, such markings will remain in use.

Compressed gas cylinders, including CO_2 cylinders must not be refilled if the hydrostatic test



PR.370

Figure 16-14.—Soldering the snaphook spring latch.

date has expired. This date, expressed by month-year, e.g., 6-70, is stamped on the shoulder of the cylinder each time the cylinder is retested. The hydrostatic test date is considered as having expired if the latest date stamped on the cylinder precedes the current date by more than 5 years.

Cylinders that do not exceed 2 inches in outside diameter, and that are less than 2 feet long are exempt from the hydrostatic retest.

The hydrostatic retest date applies to multiplace liferaft cylinders; if the cylinder is due for a test, discharge and disconnect the cylinder. Obtain a new cylinder from supply as a replacement and forward the old cylinder to an activity capable of conducting a hydrostatic test.

Many nonshatterable cylinders are identified by the words NONSHATTERABLE, NONSHAT, or SHATTERPROOF stamped (not stenciled) on the shoulder or side of the cylinder. Substitution of a "shatterable" for a "nonshatterable" cylinder is not authorized.

Personnel who handle compressed gas cylinders must be familiar with the color coding of cylinders. Color coding is provided as a hazard warning, and should not be used by itself to identify the contents of a cylinder. In the event of conflict with other markings, or doubt as to the contents, the cylinder should be returned to the local supply activity, (non-RFI), with instructions to forward the cylinder to the Defense General Supply Center (DGSC), in accordance with NavSupInst 4440.128B.

Inspection for deterioration of the cylinder will consist of a visual examination for the defects listed below.

Cylinders with defects that approximate the physical dimensions indicated in the following list will be condemned and returned to supply:

1. Corrosion pits in a general corrosion area that exceed a depth of 1/32-inch, or isolated pits not in a general corrosion area that exceed a depth of 5/64-inch.
2. Dents that exceed a depth of 1/16-inch, or whose major diameter is more than 32 times the depth.
3. Cuts or gouges more than 1/16-inch, or whose major diameter is more than 32 times the depth.
4. Visible arc or torch burns.
5. Evidence that the cylinder has been in a fire.
6. Discernible bulges.

All carbon dioxide inflation cylinders must be painted gray and markings must be in black letters 1/4-inch high. The information must include gross weight, tare weight, weight of carbon dioxide, and date of latest recharge. Paint and stencil the cylinder as required, insure that all markings are included as necessary.

Insure that all carbon dioxide cylinders used for liferaft inflation assemblies received from supply, except those used on the man rafts, have syphon tubes installed.

Gently tap the inverted cylinder with a small piece of wood. If any rust or other contamination falls from the cylinder, reject that cylinder, and draw another cylinder from supply; repeat the contamination check. Replace the stem in the inflation assembly valve, install a new sealing washer, and thread the inflation assembly valve onto the cylinder and tighten.

CHAPTER 17

SAFETYBELTS, SHOULDER HARNESSES, AND HELICOPTER RESCUE DEVICES

When wearing a safety harness, pilots can survive many crashes in which the cockpit or cabin remains reasonably intact, and the harness will also hold the pilot in the seat during ejection. The pilot is held in the seat while being ejected from the aircraft and then is automatically released from the seat after ejection.

What the harness must accomplish can be condensed into one statement: The lap belt and shoulder harness combination must be strong enough to hold a man in his seat under all reasonable stress conditions that might be experienced in high-speed flight, seat ejections, arrested landings, ditchings, or noseover crashes. It must be designed so that it can be released quickly.

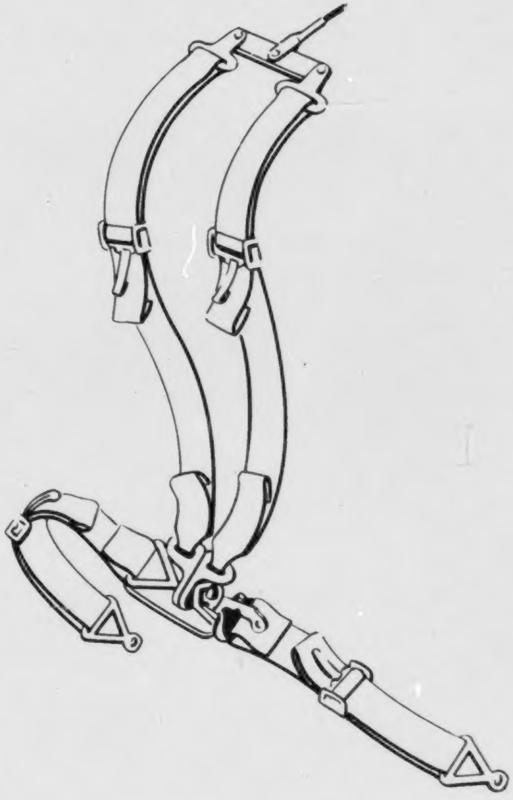
Testing and proof loading of safety belts and shoulder harnesses are performed at Naval Aircraft Rework Facilities (NARF).

PILOT'S LAP BELT AND SHOULDER HARNESS

Pilot's safety belts may be furnished as complete assemblies, consisting of lap and shoulder straps, or as individual components. There are several types of lap belts and shoulder harnesses. Figure 17-1 illustrates a complete assembly of one type.

PILOT'S LAP BELT (MS 22033)

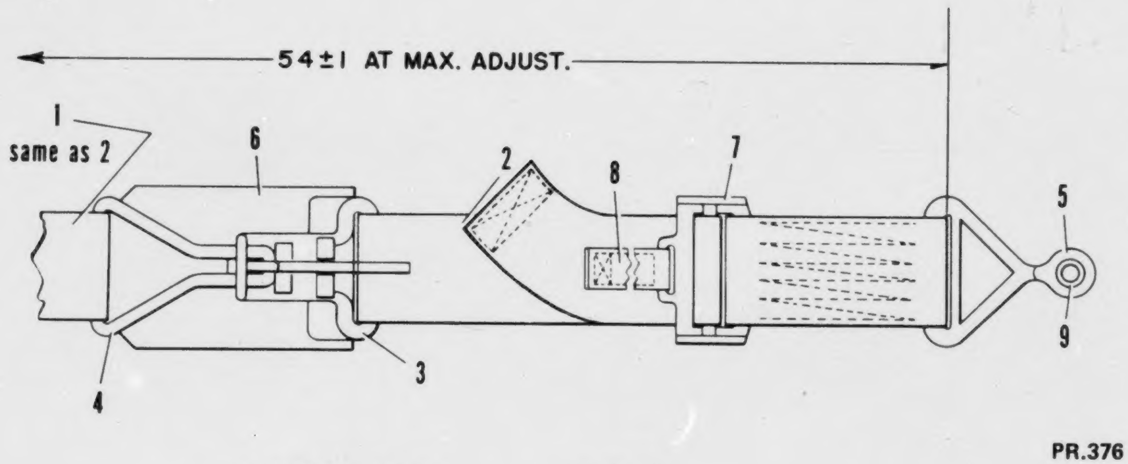
Figure 17-2 illustrates the pilot's lap belt (MS 22033) showing its stitching pattern, parts assembly, and other significant physical characteristics. The MS 22033 lap belt assembly is subjected to proof loading during the progressive aircraft rework (PAR) cycle to insure proper performance and integrity.



PR.375

Figure 17-1.—Pilot's lap belt and shoulder harness.

The proof load test for the lap belt amounts to 6,000 pounds doubled load or 3,000 pounds end load. After this test, no excessive deformation of the parts of stitching is permitted in the assembly. The latch must work freely when the load is released.



1. Right side of belt. (3-inch nylon webbing).
2. Left side of belt (3-inch nylon webbing).
3. Latch assembly.
4. Link.
5. Loop.
6. Leather protector.
7. Adapter.
8. Pull tab.
9. Bushing.

Figure 17-2.–Pilot's lap belt (conventional type).

The ultimate load and proof requirements applied to a lap belt immediately after its manufacture (at the plant) should not be confused with the periodic service tests given this equipment in the field. PAR test proof loads do not even approach the tensile strength capacity of the assembled belt.

All major stitching is done with 6-cord nylon thread, size E being used in the less important areas not concerned with tensile strength.

LAP BELT (AUTOMATIC-RELEASE TYPE)

Safety belts installed in aircraft with ejection seats in accordance with installation MS 16036 have an automatic-release feature incorporated. Its function is to hold the pilot in the seat during ejection, then open automatically and arm the parachute actuator after the pilot and seat are clear of the aircraft. This feature is designed to eliminate the necessity of the pilot releasing his safety belt at exactly the proper time and pulling his own ripcord, thus making ejection from an aircraft a much simpler and safer task.

The automatic-release type safety belt is cartridge operated. The complete assembly consists of the two belt halves, link latch, cable assembly, actuator assembly, and actuating unit assembly, as shown in figure 17-3.

When an automatic parachute actuator is used, the cable to the actuator is attached to the belt as shown in figure 17-3. When the belt is automatically separated and the pilot leaves the seat, the parachute actuator arming link is restrained by shoulders on the belt adapter link, pulling the cable and arming the actuator.

Piston action in the actuator assembly pulls the cable which is secured to a link holding the safety belt, shoulder harness and parachute arming wire together. If the automatic release fails to operate, the belt and shoulder harness can be released manually in the normal manner and the pilot must pull his own ripcord.

During normal use, the belt halves are manually joined and separated to attach or free the parachute actuator link so that the parachute

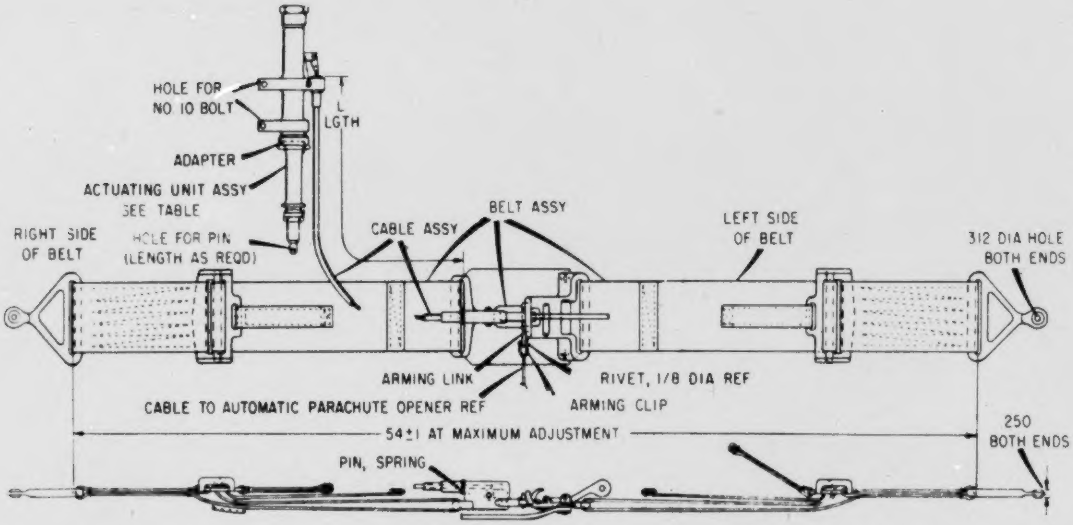

HOLE FOR
NO 10 BOLT
L
LGTH
ADAPTER
ACTUATING UNIT ASSY
SEE TABLE
RIGHT SIDE
OF BELT
HOLE FOR PIN
(LENGTH AS REQD)
CABLE ASSY
BELT ASSY
LEFT SIDE
OF BELT
312 DIA HOLE
BOTH ENDS
ARMING LINK
RIVET, 1/8 DIA REF
CABLE TO AUTOMATIC PARACHUTE OPENER REF
ARMING CLIP
54±1 AT MAXIMUM ADJUSTMENT
250
BOTH ENDS
PIN, SPRING
PR.377

Figure 17-3.—Lap belt, automatic-release type.

can be removed from the seat without danger of actuating the automatic actuator.

A proof load test of 235 pounds is made when the automatic-release type safety belt is safetied with 0.040 copper lockwire. With no lockwire the proof load test is 175 pounds.

SHOULDER HARNESS

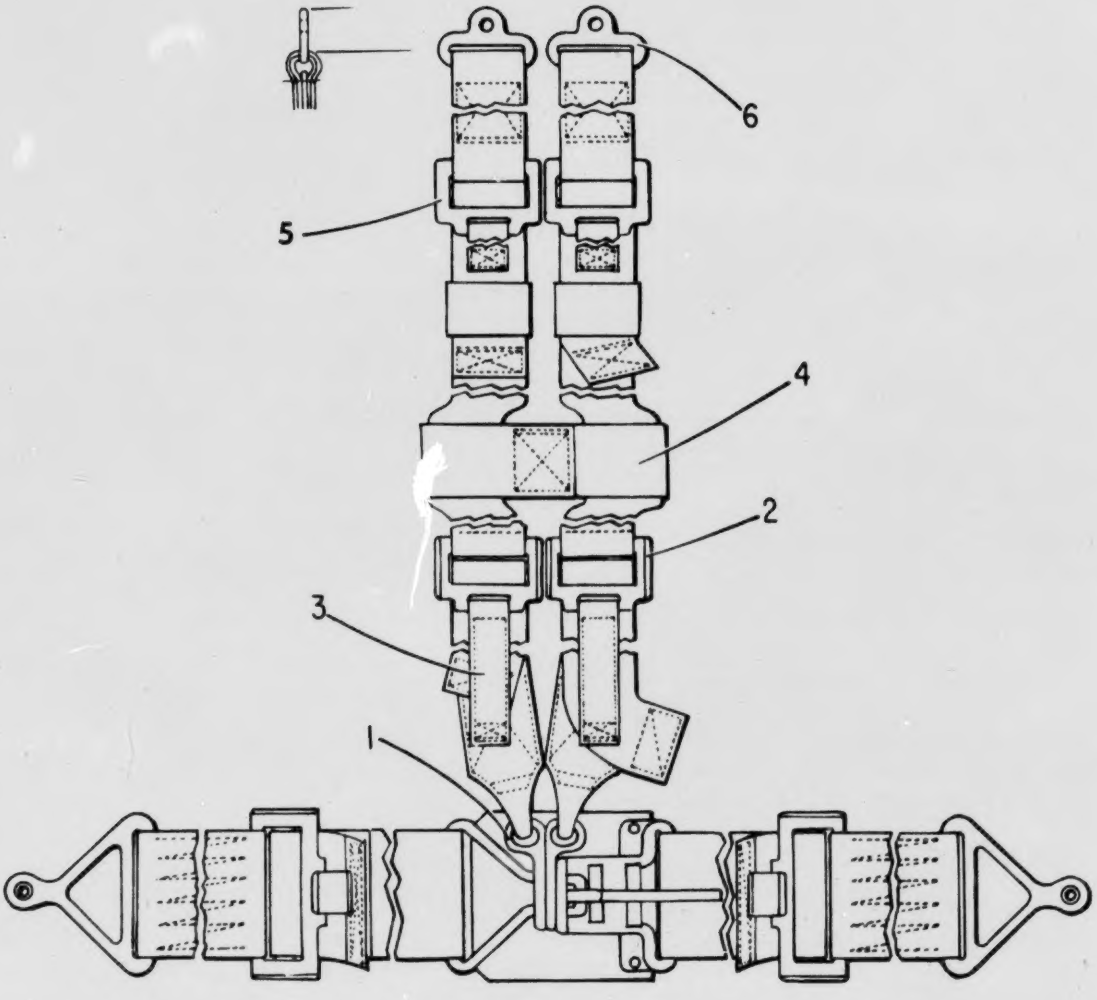
Figure 17-4 illustrates the H-type shoulder harness' dimensions, its stitching pattern, how it is put together, its parts, and other significant physical characteristics. The Y- and V-types are shown in figures 17-5 and 17-6. Where the lap belt remains fairly standard in its attachment to the pilot's seat, the shoulder harness must quite often be modified to fit its anchored location. This subject will be discussed under installation.

The anchor plate of the Y-type is adjustable, making it possible to lengthen or shorten the leg of the harness for a particular aircraft installation. The length of the leg of the Y must be adjusted so that there is adequate shoulder harness adjustment available, yet the crotch of the Y is not on the pilot's neck. During the manufacture and before acceptance, shoulder straps are subjected to a 3,500-pound ultimate load. A reasonable deformation of the parts is permissible.

A proof load of 3,000 pounds is also made and the straps must not have slipped appreciably through the adjustment loops. No noticeable deformation of any kind is permitted in this test. The proof test, then, establishes the highest tensile strength load a shoulder harness will withstand and still operate satisfactorily afterwards. The ultimate test is designed to stop at a tensile strength value just short of complete destruction. With reasonable care and by applying preventive measures, the shoulder harness will give long and honored service, easily passing its field test loads. The latest straps are made of Dacron, a "miracle fiber" similar to nylon. Dacron has less stretch than nylon.

NOTE: One assembly out of every 1,000 submitted for acceptance must be subjected to the ultimate load, and any safety belts or shoulder harness subjected to the ultimate load must not be shipped under contract.

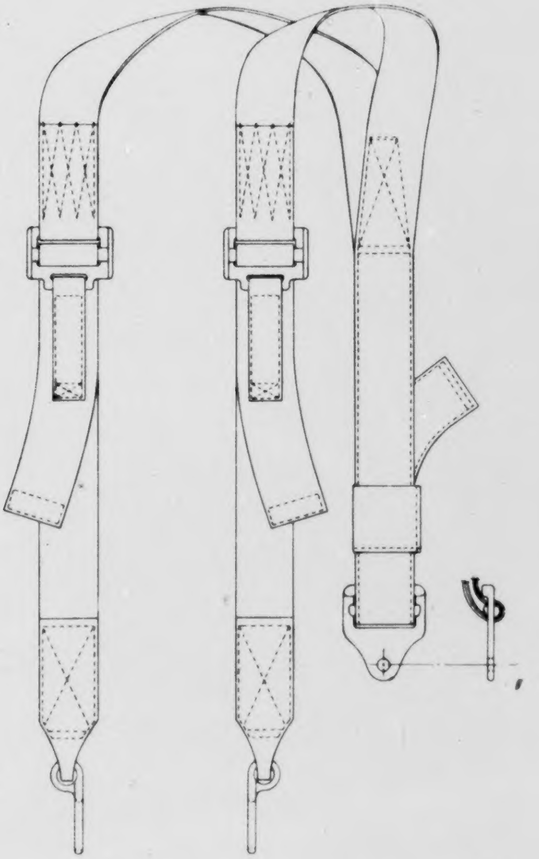
All proof testing must be accomplished with all adjustable webbing components in the fully extended position.



PR.378

1. Link (left and right).
2. Adapter.
3. Pull tab.
4. Keeper.
5. Adapter.
6. Plate attachment.

Figure 17-4.—Shoulder harness with separating keeper.



PR.379

Figure 17-5.—Pilot's shoulder harness—Y-type.

Notation of compliance and date of proof load test must be recorded in the Aircraft Log Book, OpNav Form 4790/24A.

MISCELLANEOUS SAFETY BELTS

CREWMAN'S BELT

The crewman's safety belt is designed to permit a reasonable amount of movement of the wearer in performing his duties while holding him securely in the aircraft. Figure 17-7 illustrates the MS 16070 belt. The tail strap which is adjustable (22 inches to 65 inches, approximately) can be anchored to any strong part of the aircraft's structure which is adaptable to its hook. Normally the smaller the amount of tail strap payed out, the less will be the danger of being whipped about when the aircraft is maneuvered violently.

As the crewman makes the attachment, he should anchor to a strong structural member making certain that the attachment will not mar or damage equipment.

GUNNER'S BELT

The gunner's belt side straps permit more movement than the pilot's type (which is designed primarily to hold him solidly in his seat). The length of the gunner's belt side straps is adjustable, thereby permitting the wearer security in standing as well as in sitting (See fig. 17-8.)

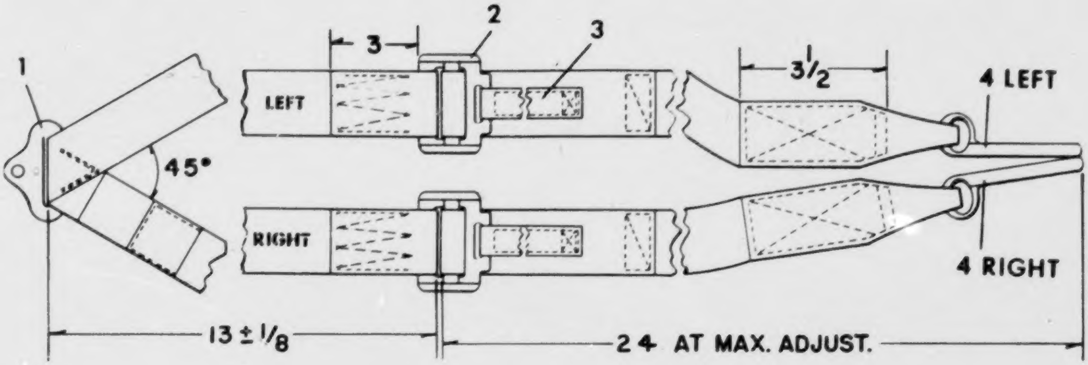
TROOP AND PASSENGER BELTS

Passenger belts are not used widely in naval aviation. They are installed in certain utility and transport aircraft and in some patrol types. The AN6506 troop belt is more generally specified for combatant type aircraft. Both types of belts have the quick-release feature. The troop belt is designed for an ultimate load of 5,000 pounds while the passenger type is designed to hold up under a load of 4,500 pounds. The webbing of troop and passenger belts is narrower than the pilot's belt, being approximately 2 inches. The AN6506 belt has the same type latching as the pilot's belt; however, the passenger type belt may vary with manufacturers. The AN6506 lap belt is given a proof load test of 2,500 pounds doubled load. All major stitching is accomplished with 3-cord nylon thread. Figure 17-9 shows the troop belt, while the passenger type belt and its application are shown in figure 17-10.

INSPECTIONS AND TESTS

DAILY INSPECTION

Safety belts and shoulder harnesses are inspected daily for obvious signs of wear or deterioration of the metal parts and for wear or



1. **Anchor plate.**
2. **Adapter.**
3. **Tab.**
4. **Links (left and right).**

Figure 17-6.–Pilot's shoulder harness–V-type.

fraying of the webbing. Release buckles, snaphooks, and other operating parts must be checked for proper functioning.

AIRCRAFT CALENDAR INSPECTION

Make a complete and thorough inspection of all equipment as for the daily inspection and include a close examination for corrosion, cracks, wear, fraying, rot, broken stitches or cuts in the webbing, cable or other parts.

Inspect all parts of the aircraft that the lap belts, shoulder harness, or inertia reel webbings may contact for any deformation such as sharp, jagged edges or roughness which may cause cutting or excessive abrasion.

Note the date of proof load testing of affected components. All components are to be proof load tested in accordance with Air Crew Systems Bulletin No. 2 to insure that the prescribed test intervals are not exceeded before the next calendar inspection.

Correct all discrepancies by local repair, modification, or by replacing components. If a discrepancy is found to be due to aircraft, seat, or restraint system design, submit a UR describing the defect in detail.

PAR/OVERHAUL INSPECTION

During aircraft PAR or overhaul, remove lap belts, shoulder harness and inertia reel, and takeup reel webbings. Conduct a thorough visual inspection as for aircraft calendar inspection. Perform proof load tests of all components and replace all cotton with nylon or dacron.

Test/Replacement Intervals

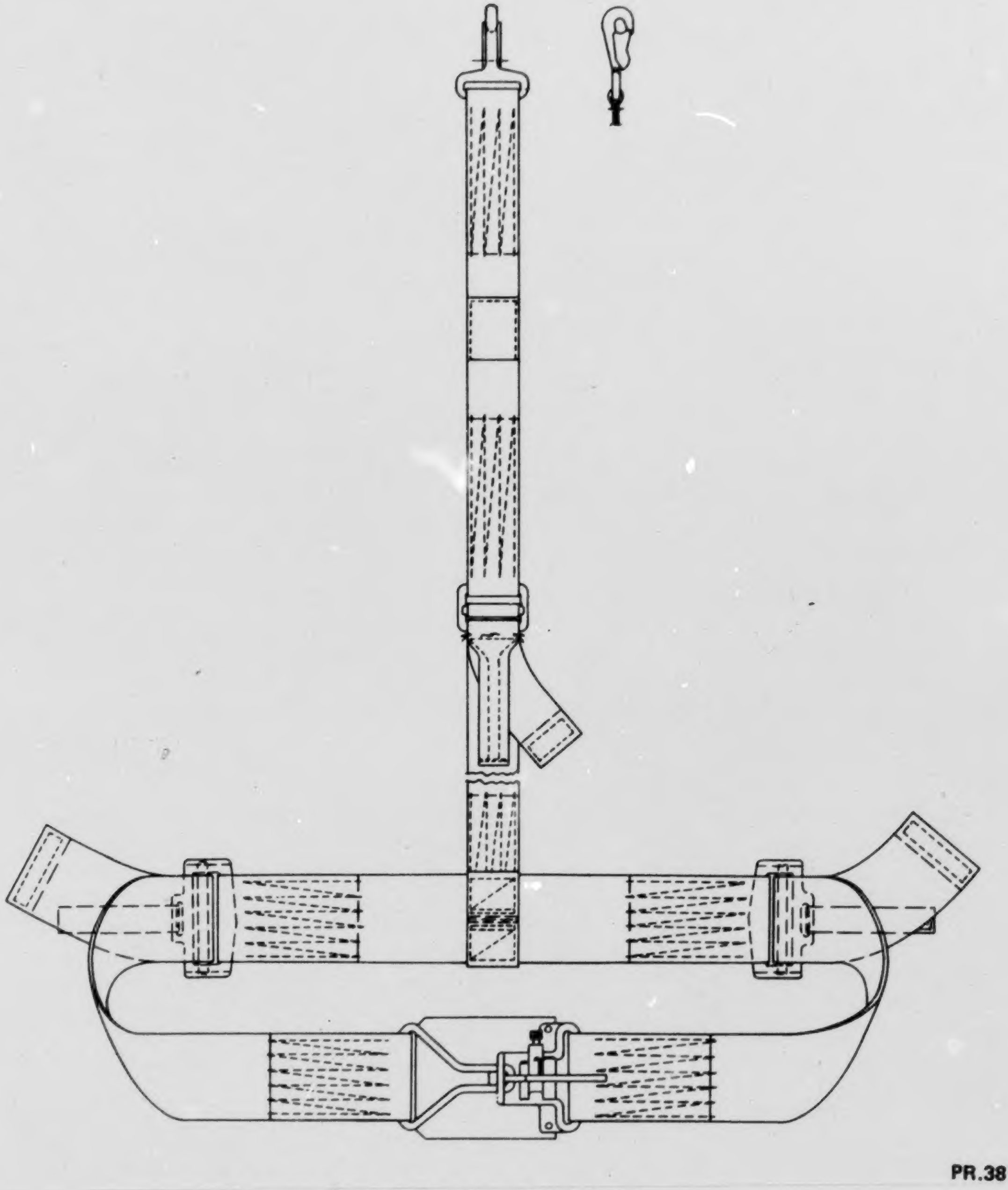
Lap belts, shoulder harness, and inertia reel webbings are to be proof load tested prior to installation and at intervals not to exceed the following:

Safety belts and straps which are made of cotton are removed from the aircraft, inspected thoroughly, and proof load tested every 6 months, then replaced with equipment made of nylon or dacron at the next PAR.

Safety belts and straps which are made of synthetic materials (nylon or dacron) are proof load tested during the applicable PAR cycle.

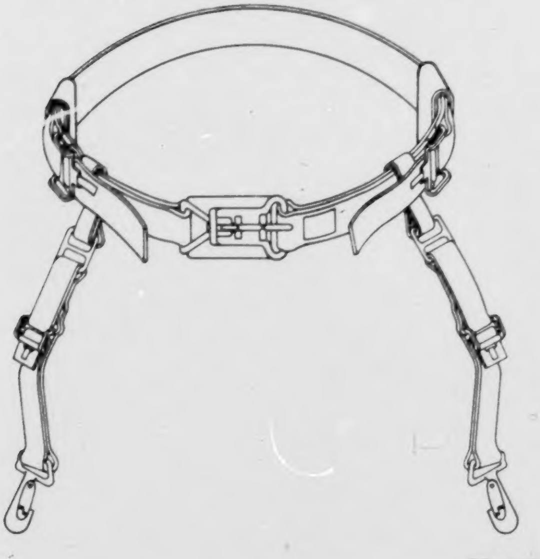
Proof Load Testing

Test loads to be applied are listed in Air Crew System Bulletin No. 2.



PR.381

Figure 17-7.—Crewman's safety belt.



PR.382

Figure 17-8.—Gunner's safety belt.

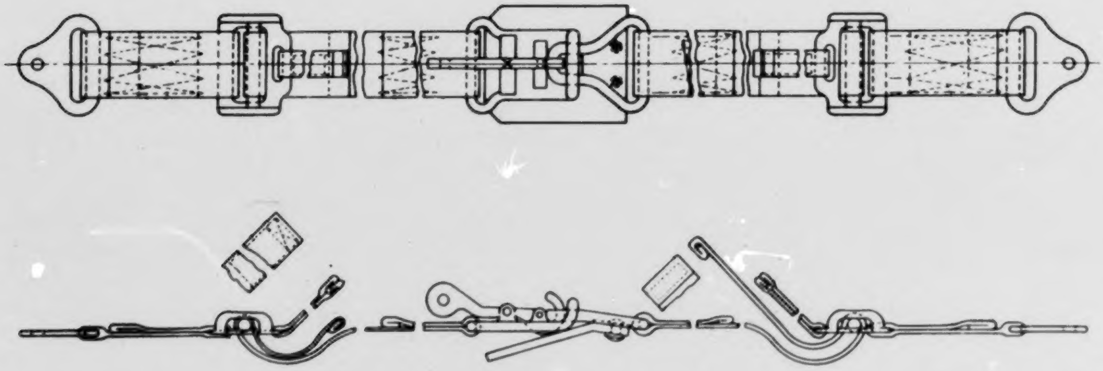
Test equipment is to be recalibrated at intervals not to exceed 6 months.

When performing proof load tests, the load is to be applied by a loading device with a separation rate of approximately one inch per second, until the specified test load is reached. The load is to be held for 30 to 60 seconds and then released. After completion of the test, inspect the item for broken stitches or other evidence of failure. There must be no perceptible slippage of the webbing through the adjustment loops, and the lap belt release must work freely. The quick release buckle of the lap belt must be operable under a pull of NOT OVER 45 POUNDS ON THE LATCH WHILE THE BELT IS SUBJECTED TO A STATIC LOAD OF 400 POUNDS.

PROOF LOAD TESTING EQUIPMENT

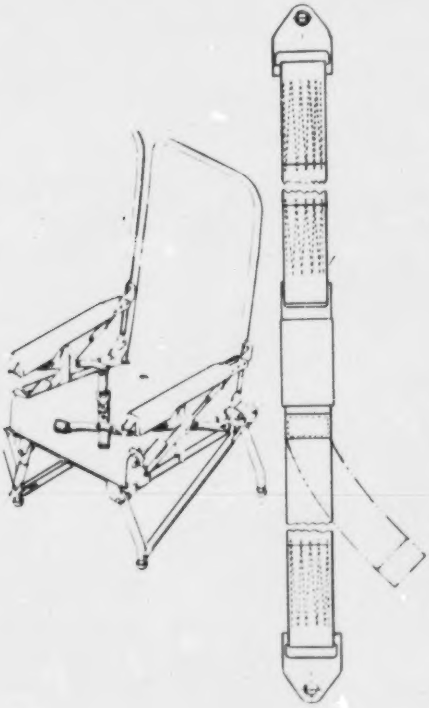
Any one of several methods may be used for applying the prescribed proof load to the belts and straps; for example, mechanical tension tester, tripod lifts, deadweight loading, and others. The accuracy of the actual reading is more important than the manner in which the test load is applied.

A testing jig is shown in figure 17-11. Its capacity is approximately 5,000 psi, a necessary reserve in power. The device can be mounted horizontally or vertically depending on the dictates of the physical plant. The movable head and the stationary head should be mounted far enough apart so that all lengths of belts and harnesses together with their necessary mounting clamps or adapters can be accommodated. In many cases, these have to be manufactured



PR.383

Figure 17-9.—Troop type safety belt.



PR.384

Figure 17-10.—Passenger type safety belt.

locally. Any PR can design the special jig necessary to do the job. For example, the part used in the aircraft to hold the mounting plate of a shoulder harness can be rigged to a testing jig and be used for the same purpose during test.

The device shown in figure 17-11 is adequate. Its construction details need not be followed closely. As a precaution, a wire cage must be constructed and placed over the area that lies between the two attachment heads. Then the operator will be guarded against the possibilities of sudden breakage and the accompanying whipping action that takes place.

Calibration

After construction of a testing device, it will be necessary to recalibrate the pressure gage from psi to pounds. This will insure an easily read value in relation to the specified tension load. Calibration can be done by any of the methods suggested below. The load in pounds (50-pound increments) can be marked directly on the gage dial, or a chart may be prepared to indicate the equivalent load in pounds for the corresponding psi graduations.

1. DEADLOAD. Secure the actuating cylinder in an upright position with the piston rod downward. Record the pressure (psi) required to lift deadloads of known weights.
2. SPRING. Place a large capacity spring scale of known accuracy between the two jaws of the test device and apply pressure. Record the loads in pounds shown on the scale versus the pressure in psi indicated by the gage.
3. DYNAMOMETER. Place a loop or Chatillon dynamometer of approximately 5,000 pounds capacity between the two jaws of the testing device and apply pressure. Record the load in pounds against the psi indicated by the gage.

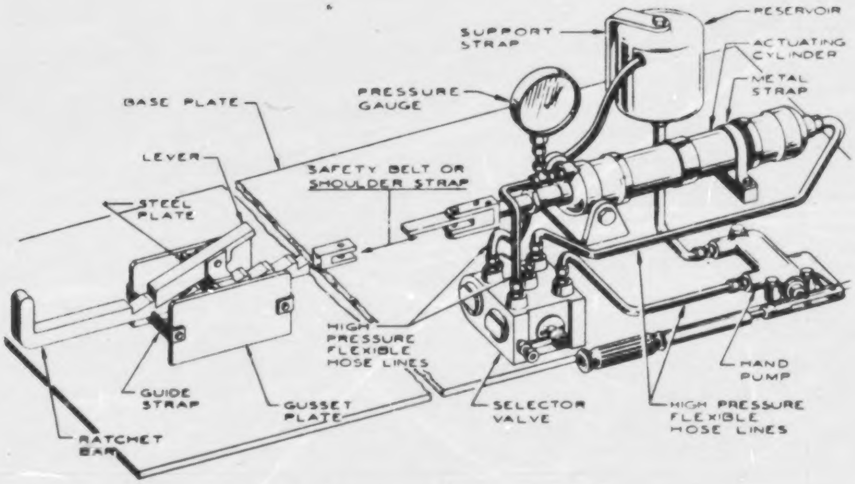
Operation

The device requires only one man to operate it. Secure one end of the belt or shoulder strap to the ratchet rod and the other end to the piston rod. The length of the adjustable ratchet and the piston rod will afford sufficient clearance for testing belts of various lengths. Turn the selector valve handle to the loading position. Apply the required load by operating the hand pump. Read the load on the calibrated gage. Hold for 30 seconds or 1 minute, as specified for the particular harness, and release the load by turning the selector valve handle to an unloading position.

Recalibrate the gage every 6 months; breakages in the system should be repaired as they occur. Replenish the oil supply when needed.

Safety belts and shoulder harnesses found to be damaged or unable to withstand the strains of testing should be replaced with the latest equipment.

Figure 17-12 illustrates the application of a testing jig to a pilot's conventional lap belt. The belt support block shown in figure 17-12 is manufactured in accordance with Air Crew System Bulletin No. 2. The important thing to consider is its adaptability to the type belt or strap arrangement being tested. As long as an anchoring adapter does not produce any twists


RESERVOIR
SUPPORT STRAP
ACTUATING CYLINDER
METAL STRAP
PRESSURE GAUGE
BASE PLATE
LEVER
SAFETY BELT OR SHOULDER STRAP
STEEL PLATE
HIGH PRESSURE FLEXIBLE HOSE LINES
HAND PUMP
GUIDE STRAP
GUSSET PLATE
SELECTOR VALVE
HIGH PRESSURE FLEXIBLE HOSE LINES
RATCHET BAR

PR.385

Figure 17-11.–Safety belt and shoulder harness testing jig.

or undue strain on the article under test, it may be considered adequate.

HELICOPTER RESCUE DEVICES

Every Aircrew Survival Equipmentman should be familiar with the equipment used in rescue from the sea or land by helicopter. The helicopter's ability to land and take-off in a small area and to hover over a spot lends itself very effectively to rescue work.

There are three methods by which a helicopter may make a rescue. The first is by hovering, the second by landing, and the third by making a low slow pass with the rescue device hanging near ground level. The latter is used mainly in hostile areas when the helicopter pilot does not wish to present the aircraft or the survivor as a stationary target for enemy gunners. By far, the most common helicopter pickup is made by hovering.

NOTE: When the rescue device is lowered to the survivor, he should avoid touching it until it has contacted the surface. The static charge of electricity built up in the helicopter must be dissipated by grounding. Otherwise a stunning electrical shock may result.

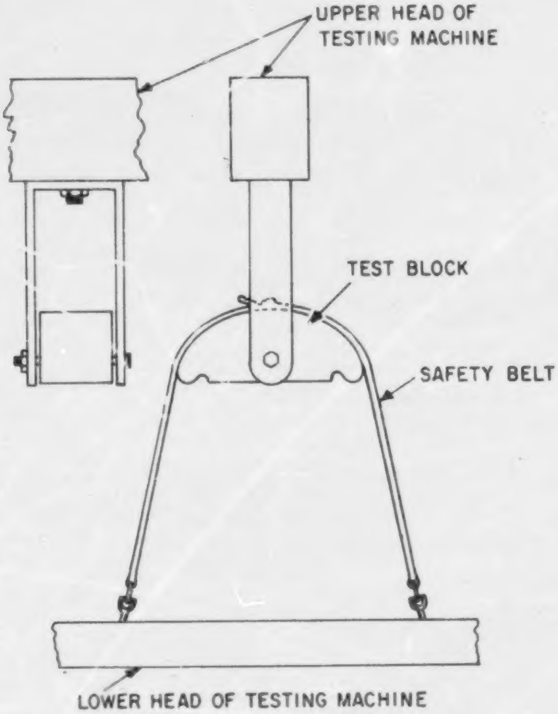
Research, development, test, and evaluation of air rescue devices has been continuous since the helicopter became the primary rescue vehicle. The various types of rescue devices, their functions, and associated maintenance procedures will be discussed in the following sections.

HELICOPTER RESCUE SLING ASSEMBLY

The helicopter rescue sling assembly, as shown in figure 17-13, is a buoyant rescue device consisting of a kapok filling encased in a yellow waterproof covering, designed to be worn by survivors who are to be hoisted to safety in sea-air or land-air rescue operations. The sling has long been the standby in rescue work, and it is carried in all rescue helicopters.

The rescue sling will accommodate only one survivor at a time, and the survivor must enter the sling properly or he may slip out of it while being hoisted.

Whether on land or sea, the survivor must remember to shed his parachute and get clear of it before hoisting operations begin. If in a liferaft, he should deploy the sea anchor and stay with the liferaft. If the helicopter rotor downwash blows his liferaft around, the survivor may



PR.386

Figure 17-12.—Application of a testing jig to a pilot's conventional lap belt.

get into the water but he should still be attached to his liferaft by means of a lanyard. By no means should he release his liferaft until after he is secure in the rescue device. If he released his liferaft too soon, and the helicopter could not make the rescue, he would be without a liferaft. A survivor must never discard or abandon any item of survival equipment unless he is absolutely certain that rescue is imminent.

Imminent, in this case, is when the survivor is securely attached to the rescue device.

The helicopter rescue sling is composed of the following parts:

1. Survivor's sling:
   a. Horse collar shape.
   b. Filled with kapok.
   c. Ends terminate in "V" rings for attachment to winch cable.
   d. Retainer strap with snap and adapter.
   e. "Remove Chute" stenciled at various points.
   f. Floats in the water in a vertical position.
2. Crewman's sling (constant-wear):
   a. Kapok filled.
   b. Nonseparating.
   c. Snap-on adjustment strap for attachment to cable grip.
3. Cable grip (Chicago grip):
   a. Permits attachment to cable at any point.
   b. Jaws spread to release and close to attach.
   c. Clevis must point downward when used.
4. Cable weight cover:
   a. Protects survivor from injury if accidentally hit by cable weight.

Operating Procedure

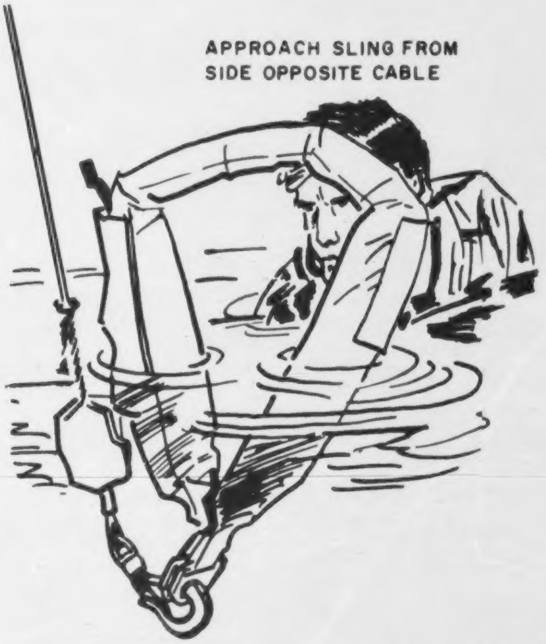
If the rescue device is the sling, approach the sling, keeping the sling between you and the hoist cable.

Extend one arm through the loop formed by the sling, then slip the sling over your head and shoulder. Put your other arm into the loop of the sling and slip the sling over the other shoulder. Finally, tuck the sling around you, making sure that the padded portion of the sling rests across your back and under your armpits for support when being raised. The retainer strap is for use around the chest only for a disabled survivor. If the survivor is incapable of helping himself, due to injury or unconsciousness, he will be rendered all possible aid by the rescue crewman, who will enter the water himself, if necessary.

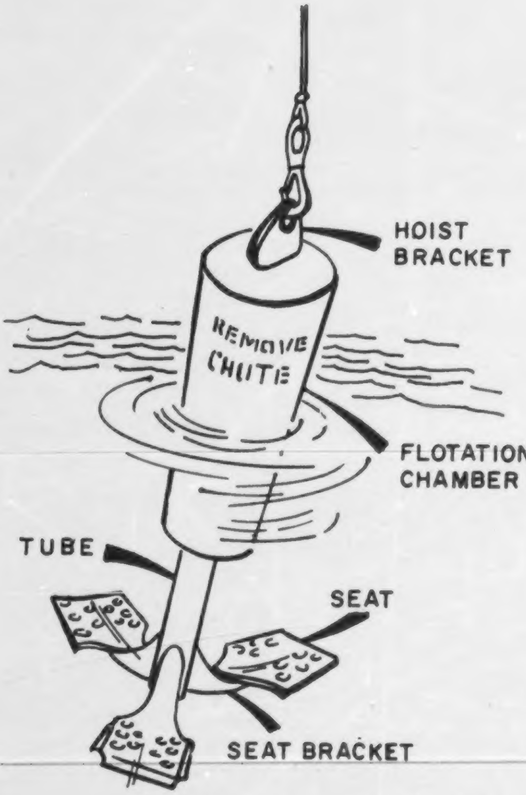
HELICOPTER RESCUE SEAT

The helicopter rescue seat, as shown in figure 17-14 is a buoyant, aluminum device consisting of a hollow flotation chamber and a three-pronged seat assembly.

Lead, inserted in the base of the tube of the assembly, helps to prevent excessive roll of the seat in the water. The flotation chamber and hoist bracket of the rescue seat are painted fire orange (high-visibility). The lower seat is painted yellow.



AN.137
Figure 17-13.–Helicopter rescue sling assembly.



AN.138
Figure 17-14.–Helicopter rescue seat.

The rescue seat holds one survivor during mobile rescue, but can accommodate two men, a crewman and the survivor, during immobile rescue.

A locally manufactured and installed type VI nylon webbing safety belt is designed to assist the rescuee in remaining on the seat during ascent to the rescue vehicle.

If the rescue device is the rescue seat, approach the seat, put your arm (or arms) around the flotation chamber, and hold the seat steady so that you can properly mount it. Two procedures for mounting the rescue seat are as follows:

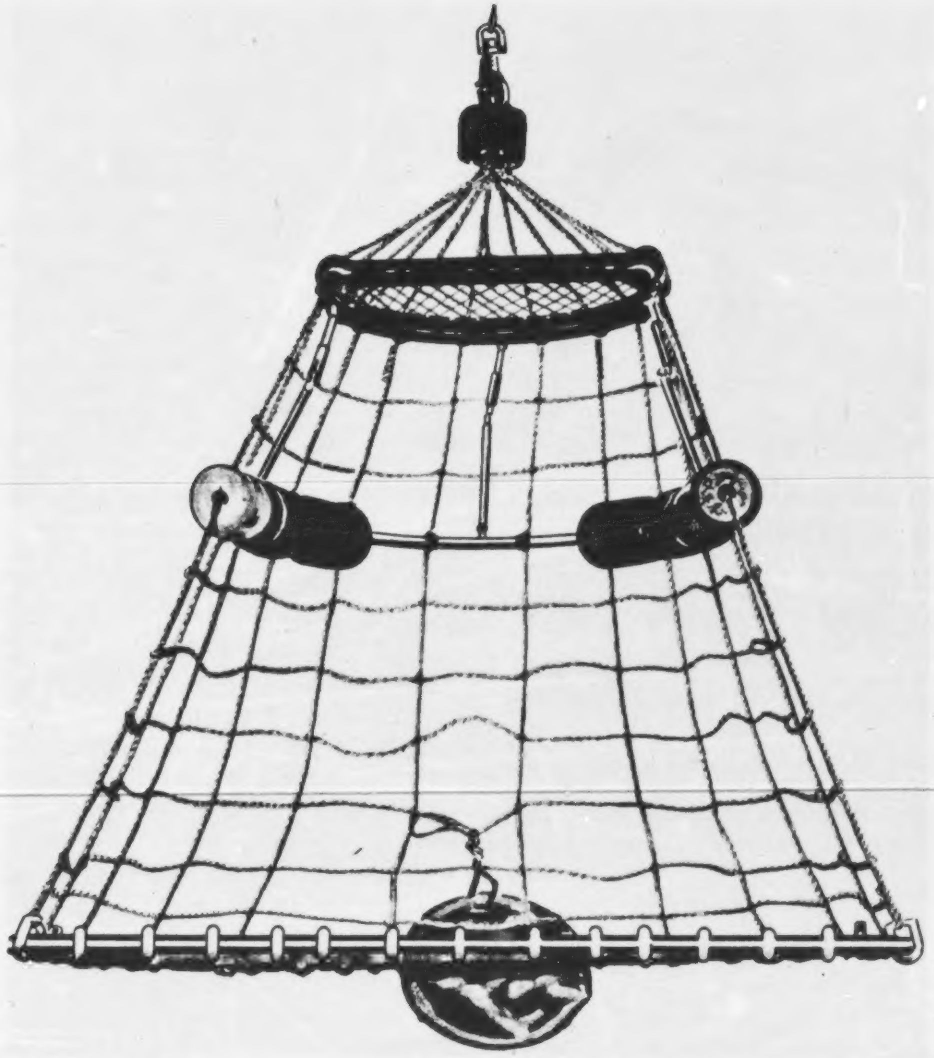
1. The preferred procedure is to sit on one seat prong, throw your legs over the other two seat prongs, cross your feet, and hug the flotation chamber of the rescue device.
2. The alternate procedure is to sit on two of the seat prongs, cross your feet, and hug the flotation chamber of the rescue device.

HELICOPTER RESCUE NET X872

The helicopter rescue net X872, shown in figure 17-15 is a rescue device weighing approximately 20 pounds which is attached to the helicopter hoist system.

The net has a conically shaped bird cage appearance and is open on one side. The net opening is approximately 59 inches wide at the bottom, and tapers to a 20-inch width at the top.

The rescue net opening is stabilized by the use of a sea anchor which has a forward diameter of 12 inches. This anchor is 9 inches long, with a 6-inch diameter at the rear, and weighs



PR.371

Figure 17-15.—Helicopter rescue net X872.

approximately 2 1/2 pounds. A 10-foot drogue line is provided with two snaps. One snap permits complete removal of the sea anchor while the other permits reduction of the drogue line length to 5 feet. The 5-foot drogue line is used in moderate sea states, while the 10-foot drogue length is used when high sea states are encountered. The sea anchor, attached to the net by use of the drogue line, also prevents the net from skipping off the waves.

The rescue net is provided with a hinged stand-up device which automatically forms a rigid cage when the net is fully extended. Foam plastic floats are provided to allow the rigid upper portion of the net to project above the water approximately 17 inches.

NOTE: The rescue net must not be launched empty from the aircraft at air speeds in excess of 40 knots.

The rescue net design specifications and construction materials are as follows:

1. Net construction is of 5/16-inch polypropylene line, having a tensile strength of 1,200 pounds.
2. The foam floats are constructed of Ethafoam.
3. Stainless steel is used in the net's metal construction.
4. The overall net strength limitation is 1,400 pounds.
5. The total weight is approximately 20 pounds.

Operation And Uses

In land/sea recovery, the survivor, after doffing his parachute or leaving his raft, need only enter and sit in the net which is then hoisted up to the aircraft. In forward flight in the net, the survivor will automatically be forced against the back of the net by gravitational forces; at the same time the open portion of the net will rotate so that the survivor faces aft. The survivor may be trailed through the air at speeds up to 60 knots. Live pickups using the rescue net are reserved for emergencies only.

IMMOBILE PICKUPS.–The design of the rescue net provides a stable work platform which permits the rescue aircrewman to use both hands in bringing an immobile rescuee aboard the net. For pickup of immobile rescuees, it is recommended that the rescue aircrewman ride the net down to the surface.

LIGHT CARGO USE.–The helicopter rescue net may be utilized for light cargo operations. A detachable light cargo retaining door 18 inches by 44 inches is provided. The retaining door attaches to the net opening by means of four signal halyard snaps. In cargo operations, the net sea anchor and drogue line must be removed to prevent their entanglement in the ships' life lines, etc.

NOTE: Extreme care must be taken not to overload the helicopter hoist system beyond the design operational limits.

MAINTENANCE OF HELICOPTER RESCUE DEVICES

After use in salt water, all helicopter rescue devices must be immersed and rinsed in fresh water. The fresh water rinse will aid in deterring damage from the effects of salt water. Rescue slings must be allowed to dry before they are load tested.

The following load testing intervals apply:

1. Rescue slings constructed of cotton webbing:
   a. After immersion in salt water.
   b. Every 6 months.
2. Rescue slings constructed of nylon webbing:
   a. Every 18 months.
   b. If the rescue sling webbing material cannot be determined, the sling must be tested as a cotton sling.

Procedures for load testing the rescue slings include assembling the sling in any acceptable device capable of producing the required tension load of 500 pounds.

The 500-pound load test must be applied to the rescue sling at the rate of approximately 1 inch per minute. Any evidence of damage to the webbing as a result of performing the proof load test will be cause for replacement.

Frayed or separated stitching and minor failures in the kapok retaining material (rips at the binding tape or no more than two 1-inch rips in other portions of the material) must be repaired, using appropriate repair material as directed.

Maintenance of the Kaman Forest Penetrator

The forest penetrator must be thoroughly examined during each aircraft inspection for freedom of part operations, security of part attachments, and obvious defects.

Required repairs will normally be performed locally as available facilities permit.

CHAPTER 18

OXYGEN AND RELATED COMPONENTS

No one can live unless he is able to get sufficient quantities of food, water, and oxygen. Of the three, oxygen is by far the most urgently needed. If necessary, a well-nourished man can go without food for many days or weeks, living on what is stored in his body. The need for water is more immediate but still will not become critical for several days. The stock of oxygen in the body is limited at best to a few minute's supply. When that supply is exhausted, death is prompt and inevitable.

Oxygen starvation affects a pilot or aircrewman in much the same way that it affects an aircraft engine. Both the man and the engine require oxygen for the burning of fuel. An engine design for low-altitude operation loses power and performs poorly at high altitudes. High-altitude operation demands a means of supplying air at higher pressure to give the engine enough oxygen for the combustion of its fuel. The supercharger or compressor performs this function.

The combustion of fuel in the human body is the source of energy for everything the aviator is required to do with his muscles and with his eyes and brain. As the aircraft climbs, the amount of oxygen per unit of volume of air decreases and the aviator's oxygen intake, therefore, is reduced. Unless he breathes additional oxygen, his eyes, his brain, and his muscles begin to fail him. He is designed for low-altitude operation and will not give satisfactory performance unless he is supplied the full amount of oxygen that his body requires. Like the engine, the body requires a means of having this oxygen supplied to it in greater amounts or under greater pressure. This need is satisfied by use of supplemental oxygen supplied directly to the respiratory system through an oxygen mask, by pressurizing the aircraft to a pressure equivalent to that at safe breathing altitudes, or both.

For purposes of illustration, an aviator's lungs may be compared with a bottle of air. If an open bottle is placed in an aircraft at sea level, air will escape from it continuously as the aircraft ascends. The air pressure at 18,000 feet is only half that at sea level; therefore, at 18,000 feet the bottle will be subjected to only half the atmosphere pressure it was subjected to at sea level. For this reason, it will contain only half the oxygen molecules it had when on the ground.

In like fashion, an aviator's lungs contain less and less air as he ascends and correspondingly less oxygen. Thus, the use of supplemental oxygen is an absolute necessity on high-altitude flights. Above 35,000 feet, normal activity is possible up to about 43,000 feet by use of positive pressure equipment. This equipment consists of a "supercharger" arrangement by which the oxygen is supplied to the mask under a pressure slightly higher than that of the surrounding atmosphere. Upon inhalation, the oxygen is forced into the lungs by the system pressure. Upon exhalation, the oxygen pressure is shut off automatically so that carbon dioxide can be expelled from the mask. Normal activity is possible to 50,000 feet with the use of a pressure breathing oxygen regulator. Above 50,000 feet, the only adequate provision for the safety of the aviator is pressurization of the entire body.

Up to about 35,000 feet, an aviator can keep a sufficient concentration of oxygen in his lungs to permit normal activity by use of demand oxygen equipment that supplies oxygen upon demand (inhalation). The oxygen received by the body on each inhalation is diluted with decreasing amounts of air up to about 30,000 feet. Above this altitude up to about 35,000 feet, this equipment provides 100 percent oxygen. At about 35,000 feet, inhalation alone will not provide enough oxygen with this equipment.

EFFECTS OF HYPOXIA

A decrease in the amount of oxygen per unit volume of air results in an insufficient amount of oxygen entering the bloodstream. The body reacts to this condition rapidly. This deficit in oxygen is called HYPOXIA. A complete lack of oxygen, which causes death, is called ANOXIA. If the body is returned to its normal oxygen supply, one may recover from hypoxia, but cannot recover from anoxia.

Many persons are not aware of the enormous increase in need for oxygen caused by an increase in physical activity. Strenuous calisthenics or a cross-country run results in deep and rapid breathing. Even so mild an exercise as getting up and walking around a room may double the air intake. In the case of the aviator, leaking of an oxygen mask which may go completely unnoticed while the wearer is at rest may lead to collapse and unconsciousness when he attempts to move about from one station to another in the aircraft. A walkaround (portable) oxygen bottle sufficient for 24 minutes of quiet breathing may be emptied by 17 minutes of use when the user is moving about the aircraft.

Men differ in their reactions to hunger, thirst, and other sensations. Even an individual's reactions vary from time to time under different circumstances. Illness, pain, fear, excessive heat or cold, and many other factors govern what the response will be in each particular case. The same thing is true of individual reactions to oxygen starvation. The effects of a certain degree of hypoxia on a given person cannot be accurately predicted. For instance, a person may be relatively resistant on one day, but highly susceptible the next.

It is difficult to detect hypoxia, because its victim is seldom able to judge how seriously he is affected, or often that he is affected at all. The unpleasant sensations experienced in suffocation are absent in the case of hypoxia. Blurring of vision, slight shortness of breath, a vague, weak feeling, and a little dizziness are the only warnings. Even these may be absent or so slight as to be unnoticeable.

While still conscious, the aviator may lose all sense of time and spend his last moments of consciousness in some apparently meaningless activity. In such a condition he is a menace to his crew as well as to himself. Since the aviator understands that it is the reduced air pressure at higher altitudes which determines the effect upon his body, he depends upon the altimeter rather than his sensations or judgment to tell him when he needs oxygen.

CHARACTERISTICS OF OXYGEN

Oxygen, in its natural state, is a colorless, odorless, and tasteless gas. Oxygen is considered to be the most important to life of all the elements. It forms about 21 percent of the atmosphere by volume and 23 percent by weight.

Of all the elements in the universe, oxygen is the most plentiful. It makes up nearly one-half of the earth's crust and approximately one-fifth of the air we breathe.

Oxygen combines with most of the other elements. The combining of an element with oxygen is called oxidation. Combustion is simply rapid oxidation. In almost all oxidations, heat is given off. In combustion, the heat is given off so rapidly it does not have time to be carried away; the temperature rises extremely high, and a flame appears.

Some examples of slow oxidation are the rusting of iron, drying of paints, and the changing of alcohol into vinegar. Even fuels in storage are slowly oxidized, the heat usually being carried away fast enough; however, when the heat cannot easily escape, the temperature may rise dangerously and a fire will break out. This is called spontaneous combustion.

Oxygen does not burn, but does support combustion. Nitrogen neither burns nor supports combustion. Therefore, combustible materials burn more readily and more vigorously in oxygen than in air, since air is composed of about 78 percent nitrogen by volume and only about 21 percent oxygen.

In addition to existing as a gas, oxygen can exist as a liquid and as a solid. Liquid oxygen is pale blue in color. It flows like water, and weighs 9.54 pounds per gallon.

Liquid oxygen, commonly referred to as LOX, is normally obtained by a combined cooling and pressurization process. When the temperature of gaseous oxygen is lowered to -182°F under about 750 psi pressure, it will begin to form into a liquid. When the temperature is lowered to -279°F, it will remain a liquid under normal atmospheric pressure.

Once converted into a liquid, oxygen will remain in its liquid state as long as the temperature is maintained below -297°F. The liquid has an expansion ratio of 862 to 1, which means that one volume of liquid oxygen will expand 862 times when converted to a gas at atmospheric pressure. Thus, 1 liter of liquid oxygen produces 862 liters of gaseous oxygen.

Until a few years ago, all oxygen carried in naval aircraft was in the gaseous state. As flight durations increased, however, it was found that weight and space problems involved with carrying increasing amounts of gaseous oxygen were becoming intolerable. Liquid oxygen has proven the answer to these problems. In its liquid state, oxygen can be "packed" into containers small and light enough to be carried even in fighter type aircraft without weight and space penalty.

In the aircraft, oxygen in the liquid state is carried in a container called a converter. This is a double-walled, vacuum-insulated container similar to the common Thermos bottle. The converter is equipped with the necessary valves and tubing for vaporizing the liquid and warming the gas to cockpit temperatures prior to breathing.

TYPES OF OXYGEN

Aviator's breathing oxygen (MIL-O-27210C is supplied in two Types (I and II). Type I is gaseous oxygen, and type II is liquid oxygen. Oxygen procured under this specification is required to be 99.5 percent pure. This water vapor content must not be more than 0.02 milligrams per liter when tested at 70°F and at sea level pressure. This is practically bone dry.

Technical oxygen, both gaseous and liquid, is procured under specification BB-0-925. The moisture content of technical oxygen is not as rigidly controlled as is breathing oxygen; therefore, the technical grade should never be used in aircraft oxygen systems.

The extremely low moisture content required of breathing oxygen is not to avoid physical injury to the body, but to insure proper operation of the oxygen system. Air containing a high percentage of moisture can be breathed indefinitely without any serious ill effects. The moisture affects the aircraft oxygen system in the small orifices and passages in the regulator. Freezing temperatures can clog the system with ice and prevent oxygen from reaching the user. Therefore, extreme precautions must be taken to safeguard against the hazards of water vapor in oxygen systems.

OXYGEN COMPONENT TEST STANDS

Aircrew Survival Equipmentmen are responsible for shop testing aircraft oxygen system components, including regulators, emergency oxygen systems, pressure suit controllers, and other items. The AME is responsible for checking system components in the aircraft; however, in case of a suspected malfunction and for periodic maintenance testing, the component is removed from the aircraft and brought to the oxygen shop where it is tested by the PR. This testing is accomplished with the use of various types of test equipment, some of which are discussed in this chapter.

Regulator test stands are designed for testing oxygen regulators for flow capacities, oxygen concentrations, pressure characteristics, and various leakage tests at different simulated altitudes. This chapter covers the OTS-565, the -566, and the 62-A-116-E1 test stands.

OTS-565 TEST STAND

The OTS-565 is designed for testing oxygen regulators under simulated altitude conditions. By measuring the outlet suction or pressure for specified flows at given altitudes, as well as the ratio of air and oxygen delivered by the regulator, it is possible to determine whether or not the regulator performance conforms to service requirements.

Provisions are incorporated for making various leakage tasks and emergency flow tests on regulators. When properly modified, the OTS-565 can also be used for testing full pressure suit components.

The OTS-565 is equipped with Vol-O-Flo elements which are used to create the pressure drop necessary to actuate the fluid in the input/output manometers. Earlier types of test stands were equipped with glass wool canisters designed for the same purpose. The OTS-565 is also different in that the complete test stand is calibrated in inches of water instead of liters per minute (lpm).

Figures 18-1 and 18-2 illustrate the front and rear views of the equipment. The top cabinet consists of an altitude chamber, piping assemblies, control valves, input/output manometers, Vol-O-Flo elements, pressure-suction manometer, altimeter, and pressure gages. The lower cabinet contains a Gast vacuum pump directly coupled to a 1 hp motor. Figure 18-3 illustrates the pump and motor assembly.

Principles of Operation

The OTS-565 test stand is suitable for testing demand, diluter demand, pressure breathing diluter demand, or the miniature pressure breathing demand oxygen regulators having outlet pressures up to 20 inches of water. Flows are metered over the range of 0-150 lpm. Since the input/output manometers of the OTS-565 test stand are calibrated in linear inches of water, all liter-per-minute expressions or, measurements must be converted to indicated inches of water through the use of the calibration charts furnished with each test stand.

The Vol-O-Flo elements are designed to be as altitude independent as possible, but calibration charts showing various altitude lines are furnished for all altitudes and must be used to convert actual flows in liters per minute to indicate flows in inches of water. The input manometers indicate the amount of air flowing into the chamber to provide the required dilution, and the output manometers measure the amount of air-oxygen mixture flowing out of the regulator.

The outlet valves and vacuum source provide a flow demand on the oxygen regulator, which the regulator demand valve attempts to provide. The regulator outlet flow measured by the output manometer indicates whether or not the regulator is performing properly.

In a pressure breathing regulator, the pressure is provided by an aneroid element in the regulator. The pressure breathing characteristics can be determined by evacuating the altitude chamber to the desired altitude by the use of the bypass valve while the outlet valve is cracked to permit a small flow (5 to 10 lpm) through the regulator. (This small flow must be allowed to prevent overloading of the pressure-suction manometer.) The outlet valve is then adjusted for various rates of flow, and the amount of suction or pressure is obtained from the pressure-suction manometer.

In a diluter regulator, the flow passing through the regulator is not all oxygen, since ambient air is being drawn into the regulator from the chamber.

Altitude Chamber

An airtight chamber provides a space for stimulating the various test altitudes. The chamber is sealed by a plexiglass cover which rests in two brackets in front of the chamber, and is held in place by the vacuum created inside the chamber.

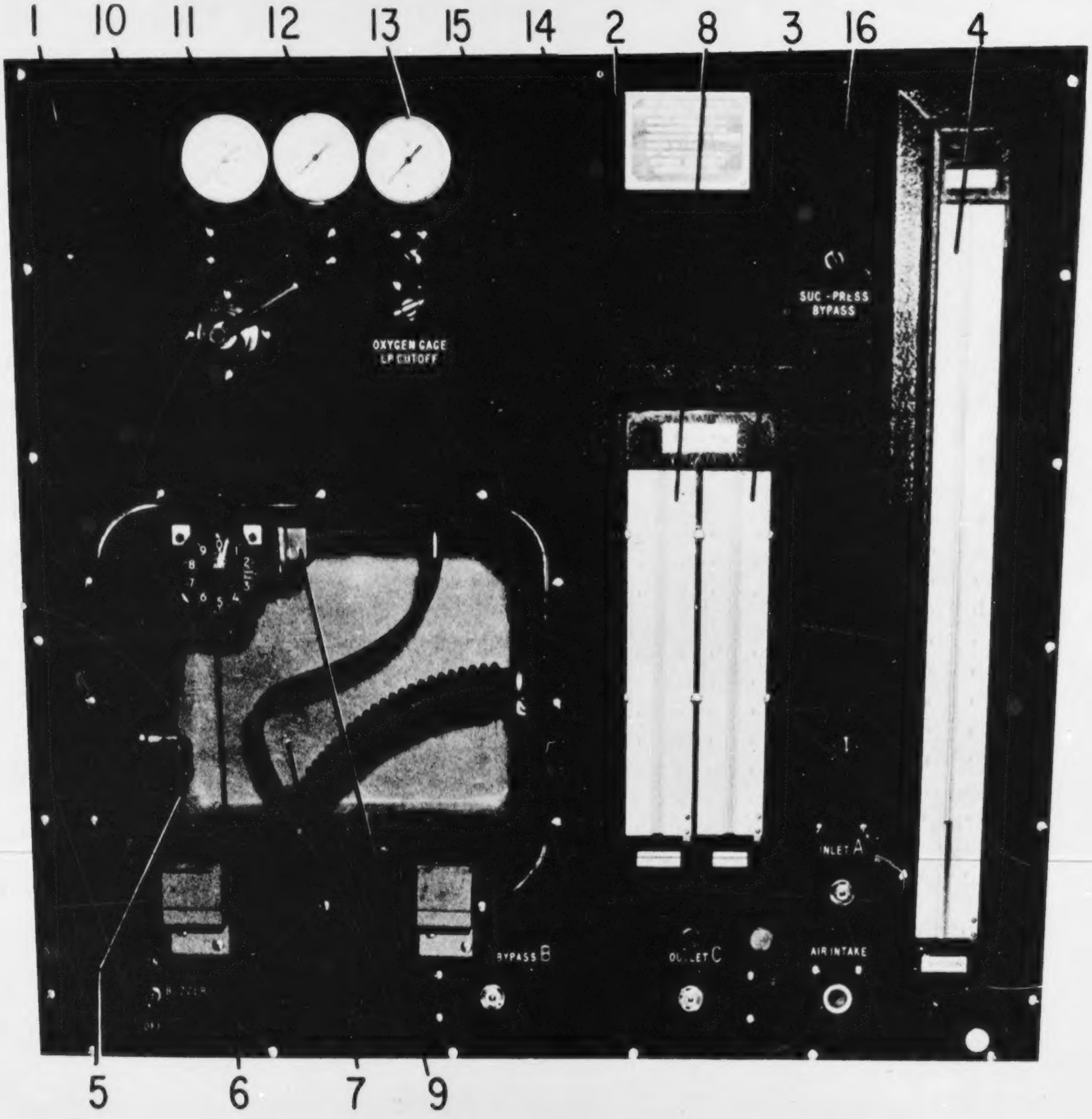
The altitude chamber has eight connections–a high-pressure oxygen inlet, an air inlet, two chamber pressure taps, a regulator outlet pressure tap, a bypass outlet, a regulator outlet, and an electrical connection.

Piping

The piping consists of two major assemblies–an air inlet assembly which permits air controlled by the air inlet valve to enter the altitude chamber, and a regulator outlet-bypass assembly which permits evacuation of the regulator outlet through an outlet valve, or evacuation of the chamber through a bypass valve. The air inlet hole, which is covered with a fine screen, should never be blocked nor should dirt or dust be permitted near it.

Control Valves

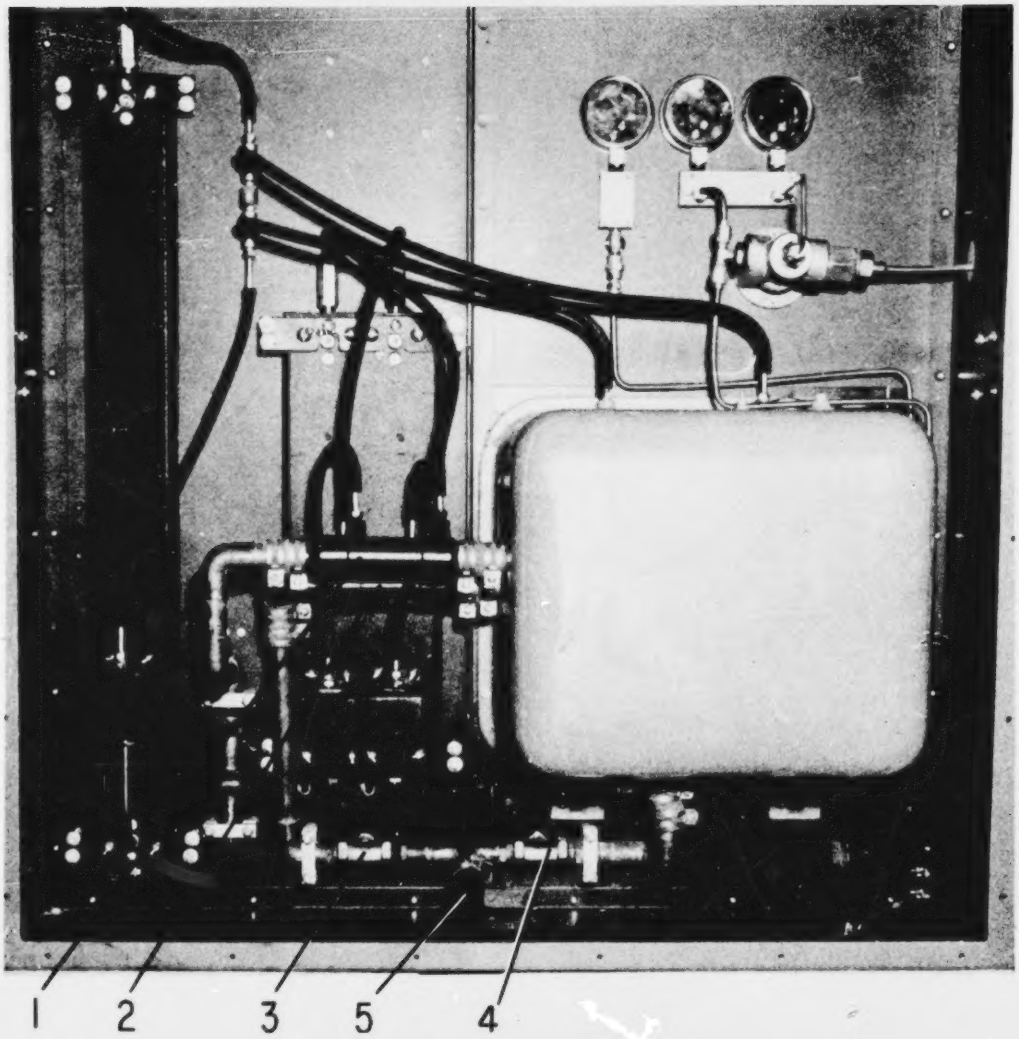
Three needle valves with a metal to metal seat are used. One, in the air inlet assembly, permits air to be bled into the altitude chamber either to maintain a chamber altitude when the regulator is removing air from the chamber through its diluter, or to permit bringing the chamber back to atmospheric pressure from a simulated altitude. The other two valves are in the outlet-bypass assembly. The outlet valve


1
10
11
12
13
15
14
2
8
3
16
4
OXYGEN GAGE LP CUTOFF
SUC-PRESS BYPASS
INLET A
BYPASS B
OUTLET C
AIR INTAKE
BUZZER
5
6
7
9

PR.387

1. Case.
2. Panel.
3. Input manometer.
4. Pressure-suction manometer.
5. Oxygen inlet.
6. Altimeter.
7. Altitude chamber.
8. Output manometer.
9. Buzzer.
10. Oxygen pressure reducer.
11. Cylinder pressure gage.
12. Regulator pressure gage, high pressure.
13. Regulator pressure gage, low pressure.
14. Oxygen gage cutoff valve.
15. Relief valve (bleed valve).
16. Pressure-suction bypass valve.

Figure 18-1.—Front view of OTS-565 test stand.



PR.388

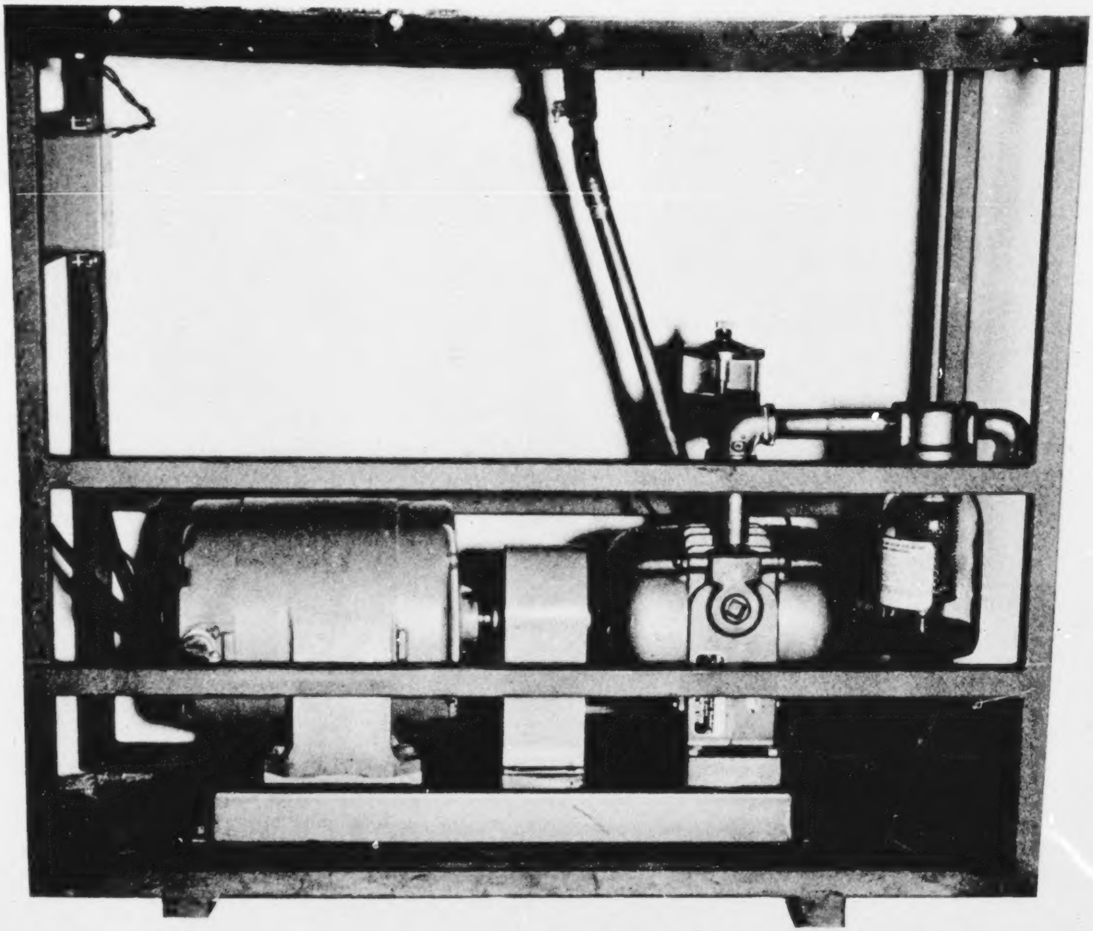
1. Vol-O-Flo inlet element.
2. Vol-O-Flo outlet element.
3. Outlet piping assembly.
4. Outlet-bypass piping assembly.
5. Vacuum outlet.

Figure 18-2.—Rear view of OTS-565 test stand.

controls the flow of air-oxygen leaving the regulator. The bypass valve permits independent evacuation of the altitude chamber. The bypass valve and inlet/outlet valves are labeled B, A, and C, respectively, on the panel.

Pressure Reducer

The pressure reducer supplied with the OTS-565 test stand is designed to regulate supply pressures up to 3,000 psi. A low-pressure gage



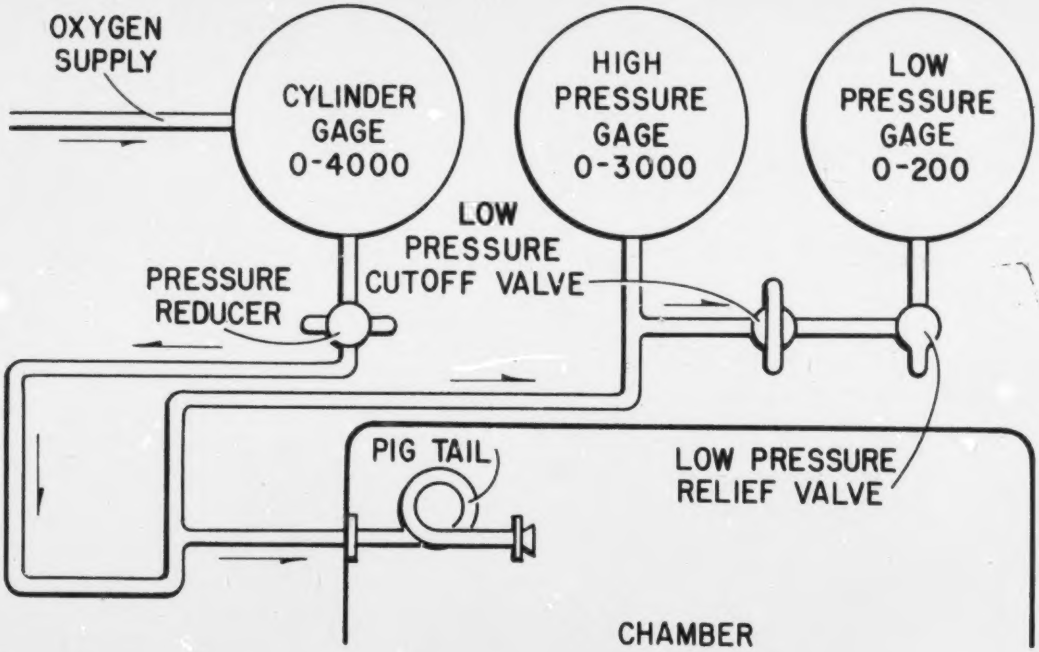
PR.389

Figure 18-3.—Front view of vacuum pump and motor assembly.

is incorporated with a cutoff valve for testing of regulators requiring oxygen of 0 to 200 psi.

The cutoff valve is connected at the tee where it joins the low-range (200 psi) gage line. (See fig. 18-4.) Low oxygen inputs can be accurately set on the low-pressure gage without any danger of overloading the gage. At approximately 200 psi, the relief (popoff and bleed) valve will dump excessive oxygen pressure. This relief valve can also be used to bleed the oxygen pressure in the lines after completion of the performance tests. The pressure set on the low-pressure gage (0-200) will also register on the high-pressure gage (0-3,000); but due to the extreme high-pressure range of the gage, the needle will barely move off the peg.

Figure 18-4 is a schematic diagram of the pressure reducer and the gage connections. When an adequate supply pressure is turned on, it will always register on the 0-4,000 psi cylinder pressure gage. Turning the pressure reducer handle clockwise supplies and increases the pressure delivered to the regulator and is registered on the high-pressure delivery gage.



PR.390

Figure 18-4.–Schematic diagram of the pressure reducer and pressure gages for OTS-565 test stand.

Extreme caution must be observed to assure that the low-pressure gage cutoff valve is closed when setting pressures in excess of the range (0-200 psi) of the low-pressure gage.

Input/Output Manometers

Two Vol-O-Flo manometers are used in the test stand. Each Vol-O-Flo manometer is connected to a Vol-O-Flo manometer element. The input manometer is in the air inlet line downstream from the air inlet valve. The output manometer is in the regulator outlet line upstream from the outlet valve. The two manometers are calibrated to indicate flows at simulated (chamber pressure) altitude. The manometers are of the linear type in which the pressure drop across the Vol-O-Flo element is directly proportional to the volumetric (ambient) flow. The manometers have a range of 0 to 12 inches of water and are inscribed in linear inches.

In addition to the two flow manometers, there is one pressure-suction manometer. The pressure-suction manometer is calibrated from -4.0 to +20.0 inches of water. The pressure-suction manometer is designed to measure the pressure and suction required to be delivered by the regulator. Excessive pressure or suction to the manometer is equalized by operating the pressure-suction bypass valve.

CALIBRATION CHARTS.–Three copies of the calibration charts are supplied with each test stand. For testing the various regulators, a table of test criteria can be setup. This table can be computed from the Vol-O-Flo element calibration charts and the performance requirements for the regulator, published in the Service Instruction Manual for the regulator to be tested.

By the use of the charts, the actual flows shown in the manual as liters per minute are converted to an indicated figure shown as inches of water. The setting made on the manometers will be affected by the density of the gas passing through the elements, by the temperature, and by the pressure. Since oxygen is 11.5 percent heavier than air, a flow of oxygen or air/oxygen will indicate higher than the same flow of air only. The test stand is calibrated with air, hence the oxygen or air/oxygen flow must be converted on the oxygen conversion graph to add the percentage of oxygen in the mixture and correct the reading, giving a corrected indicated figure.

Once a table has been established for a particular regulator, the operator has no need to make any correction to the manometer setting, other than for temperature variation.

TEMPERATURE CONSIDERATIONS.–On the linear type Vol-O-Flo element, the reading for a given flow is dependent on the gas (air, oxygen, or mixture), altitude, pressure, and temperature. The Vol-O-Flo elements are calibrated at the factory at a specified temperature, usually 72°F. If the test stand is operated in the temperature range of 65° to 80°F temperature corrections may usually be disregarded.

If greater accuracy is required or if the test stand is used at temperatures outside this temperature range, a temperature correction may be applied as follows: Determine the temperature for which the test stand was calibrated. If the test stand was calibrated against a field standard calibrator, the temperature of calibration is that for which the field standard correction curves were made. For each degree Fahrenheit the test stand is operating above the calibration temperature, the reading will be 0.15 percent too high. For each degree Fahrenheit below the calibration temperature, the manometer reading will be 0.15 percent too low. These temperature corrections are in addition to and independent of corrections for altitude or gas mixture.

Inspection

The test stand should be inspected every 6 months as follows:

1. Inspect all rubber tubing connections. If they show signs of wear or cracking, replace them.
2. Check the rubber sealing gasket around the chamber and wash it with soap and water if necessary. Keep the chamber cover plexiglass clean and free of chips.
3. Prior to operating the vacuum pump, insure that the oil reservoir has sufficient oil. Each time that oil is added the oil trap should be dumped and cleaned. The recommended oil is pure mineral oil without additives. The electric motor should be greased periodically with a good grade of motor grease.
4. The altimeter should be checked against a master altimeter or barometer to make certain it is within allowable limits.

System Leak Test

The system leak test is performed weekly. Cap off the oxygen inlet inside the chamber and secure the low pressure gage cutoff valve. With a supply cylinder, containing at least 1,800 psi of oxygen, hooked up to the system, open the supply cylinder valve. Adjust the pressure reducer to apply 500 psi to the system, then close the supply cylinder valve. The maximum allowable leakage is 50 psi in 30 minutes. Read from the oxygen cylinder pressure gage #2-17.

Chamber Leak Test

This test is also performed weekly. Cap the oxygen inlet, and evacuate the chamber to about 50,000 feet. Hold this altitude for 2 minutes and drop the altitude to 40,000 feet. Close the valves fingertight and time the rate of altitude loss for 5 minutes. The allowable loss must not be more than 100 feet per minute. Refer to NavAir 17-15BC-505 for procedures to follow for correcting excessive leakage.

Intercomparison Test

The intercomparison test is performed every two weeks and is done to determine whether the Vol-O-Flo elements are still in calibration. The test is performed at 5,000, 15,000, and 30,000 feet, using flows of 5, 50, and 85 liters per minute at each altitude. Convert the actual flows to indicate figures for both the output and input; the input actual flows must be within 1 liter or 2 percent, whichever is greater, of the output actual flow.

The test is performed by capping off the oxygen inlet and securing the oxygen supply cylinder. Open the outlet valve and ascend to altitude. Set the first flow to be pulled as the stand is ascending. Upon reaching the first test altitude, 5,000 feet, open the inlet valve to stabilize the altimeter. Take the reading from the input manometer. It must be within tolerance. Repeat steps for the other flows and altitudes. Readings not within tolerance require the Vol-O-Flo elements to be cleaned. Refer to the test stand manual for procedures.

NOTE: If at any time the suction side of the pressure suction manometer becomes overloaded, the intercomparison test must be performed prior to testing a regulator.

OTS-566 TEST STAND

The OTS-566 test stand is designed for testing diluter demand oxygen regulators under simulated altitude conditions. It was designed especially for use aboard ship, but can be used ashore as well. The OTS-566 incorporates pressure indicating gages instead of manometers; otherwise it is practically identical to the OTS-565. These gages require no fluid; thus the roll of the ship has no effect on the readings.

The test stand consists of an upper cabinet mounted on the lower pump stand. The upper cabinet contains the altitude chamber, control valves, flow measuring gages, pressure-suction gage, altimeter, and piping. The lower pump stand contains a Gast vacuum pump identical to the pump used with the OTS-565. Front and rear views of the stand are shown in figures 18-5 and 18-6.

Altitude Chamber

An airtight chamber, mounted from the rear of the test stand panel, provides a space within which the various test altitudes may be simulated. The chamber is sealed by a transparent cover plate, which rests on rollers, and can be clamped to the front of the chamber.

Gages

The gages are known as sensitive diaphragm type with the output and input having the same calibration, 0 to 12 inches of water, as the OTS-565 test stand. The gages can be adjusted by removing the plug on the face of the dial and turning the zero adjusting screw. The pressure suction gage is calibrated from -2 to +20 inches of water and also incorporates the emergency bypass valve.

Pressure Reducers

The OTS-566 has two pressure reducers. The first one, known as the high range pressure reducer, reduces the cylinder pressure of 3,000 psi down to a range of 50 to 2,000 psi. The low range pressure reducer is used to adjust inlet pressures in the range of 0 to 150 psi.

Ballast Tanks

There are three ballast tanks located inside the uppermost rear of the case. They are independent of each other and each is connected to the high side of the Vol-O-Flo elements and the pressure suction gage. The purpose of the tanks is to eliminate fluctuation of gage readings due to the sensitivity of the diaphragm.

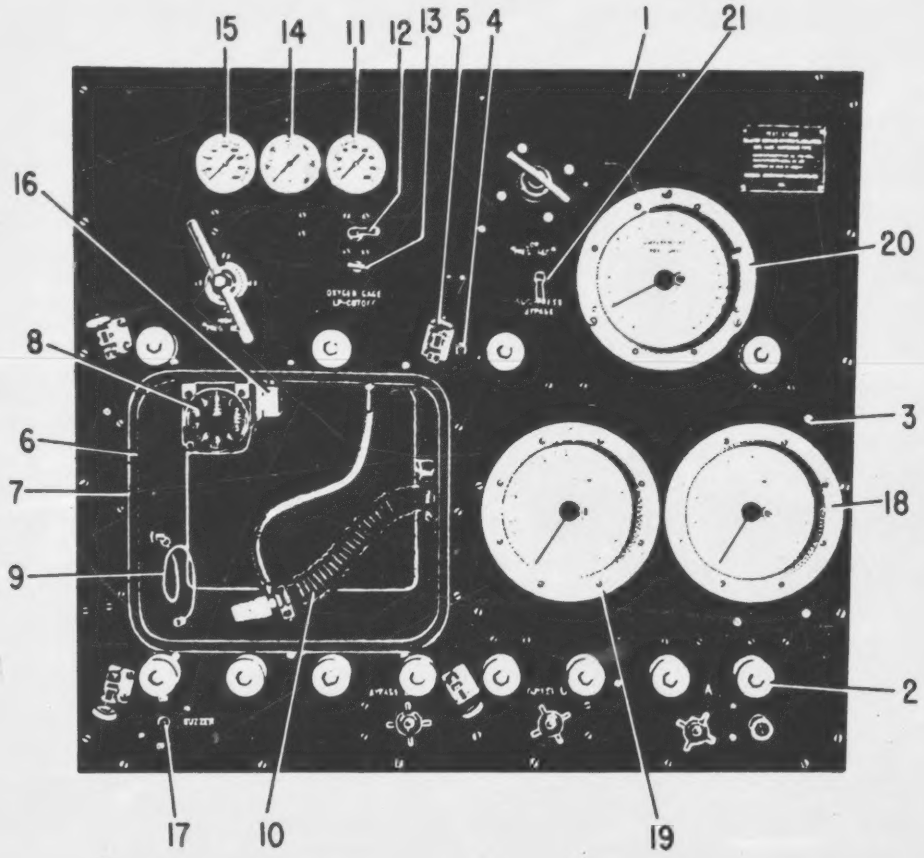
Control Valves

Three needle valves are used. One, in the air inlet assembly, permits air to be bled into the altitude chamber, either to maintain a chamber altitude when the regulator is removing air from the chamber through its diluter air valve, or to permit bringing the chamber back to atmospheric pressure from a simulated altitude.

The other two valves are in the outlet-bypass assembly. The outlet valve controls the flow of air-oxygen leaving the regulator. The bypass valve permits independent evacuation of the altitude chamber.

Gast Vacuum Pumps

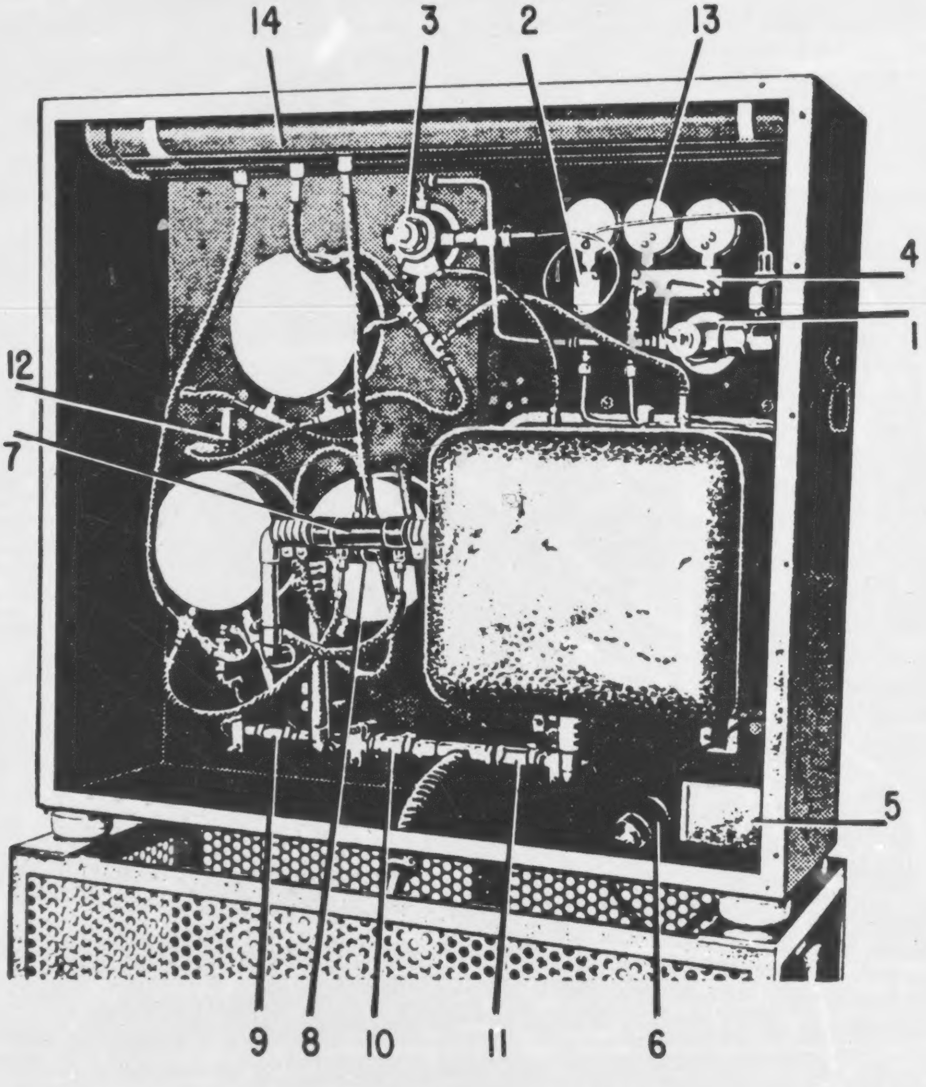
There are several types of vacuum pumps used to remove air from the altitude chambers of oxygen system test stands. The major difference in the various pumps is the pumping capacity.



1. Instrument panel.
2. Roller supports.
3. Glass end stops.
4. Glass midstop.
5. Toggle clamps and spacers.
6. Altitude chamber.
7. Chamber seal gasket.
8. Altimeter.
9. Regulator pigtail.
10. Corrugated rubber tube.
11. 200 psi gage.
12. Relief valve.
13. Oxygen cutoff valve.
14. 3,000 psi gage.
15. 4,000 psi gage.
16. Buzzer.
17. Buzzer switch.
18. Input gage.
19. Output gage.
20. Pressure-suction gage.
21. Pressure-suction. bypass.

Figure 18-5.—Front view of the OTS-566 test stand panel.

CONSTRUCTION.–The rotary Gast pump is a precision product with only 0.0015-to 0.0065-inch total clearance at the ends and top of the rotor. The vanes take up their own wear and last from 5,000 to 25,000 hours of operation, depending upon the application. Remember that it is designed for pumping dry air. Protect it against the entrance of dirt and excessive moisture. Lubricate it regularly and properly, and years of trouble-free service will be received.



PR.392

1. Oxygen pressure gage.
2. Gage mount block.
3. Oxygen pressure reducer.
4. Gage mount block.
5. Transformer, 220, 440 v.
6. Loctal plug.
7. Input Vol-O-Flo element.
8. Output Vol-O-Flo element.
9. Inlet valve.
10. Outlet valve.
11. Bypass valve.
12. Check valve.
13. Pigtail reducer.
14. Ballast tank.

Figure 18-6.–Rear view of the OTS-566 test stand.

OXYGEN SYSTEM COMPONENTS TEST STAND 62-A-116-E1

The oxygen system component test stand is designed to test and evaluate the functions of miniature regulators, console type and seat mounted regulators, diluter demand regulators, full pressure suit controllers (both kit and suit mounted), full pressure suit helmets, emergency oxygen systems, and some liquid oxygen converter components.

The test stand consists of an oxygen pressure and vacuum system with valving and instrumentation necessary to measure, test, and evaluate the performance and operating characteristics of the components described at simulated altitudes up to 150,000 feet.

WARNING: Never energize the vacuum pump without first applying 20 psi to the altitude controller (B). The controller regulator (P) is utilized for this purpose.

A detailed view of the components test stand is shown in figure 18-7; table 18-1 gives the purpose and use of the controls and instruments shown. The altitude controller (B, fig. 18-7) permits direct evacuation of the altitude chamber. It serves the same purpose on the oxygen system components test stand as the bypass valve on the OTS 565 or OTS 566 test stands.

Operation of Altitude Controller B

The altitude controller (B), figure 18-7 permits direct evacuation of the altitude chamber by opening and closing the pneumatic valve which is located between the bypass port in the chamber and the vacuum pump. To operate, insure that the shutoff to Q valve (W) is closed, and the controller regulator (P) and low pressure regulator (N) are backed out.

Turn on the oxygen supply cylinder (which is connected to the O_2 input connector No. 15, fig. 18-7); pressure will be indicated on the supply pressure gage No. 9. Using the controller regulator (P), apply 20 psi to the altitude controller (B) as indicated on the controller supply gage No. 30; the controller output gage No. 32 should also indicate 20 psi. The controller output gage No. 32 actually indicates the position of the pneumatic valve. With no pressure applied, the valve is open. If pressure is indicated on gage No. 30 and not on No. 32, the red indicator on the altitude gage No. 31 is set above sea level or rotated 360 degrees out of position.

Close the chamber door, insure that all valves are closed, and turn on the vacuum pump.

Adjust the controller set knob No. 29 to the altitude required; the chamber will automatically stop at approximately the altitude set. Adjustment will be necessary for exact altitude on the low range altimeter No. 13 or high range altimeter No. 12.

Oxygen Pressure Tests

Assuming that the test stand has been set up properly and that all necessary accessories have been attached, proceed as described in the following paragraphs.

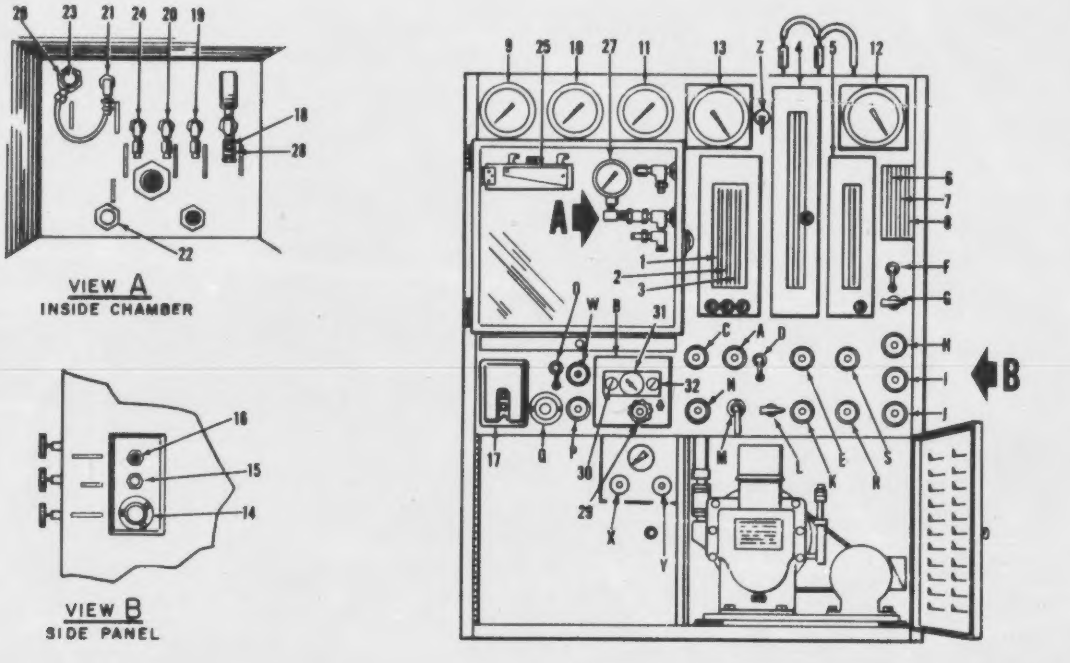
SUPPLY PRESSURE SYSTEM.–The required tests of the supply pressure system are performed as follows:

1. Ascertain that all of the test stand valves and the supply cylinder valve are closed.
2. Open, then close the oxygen supply cylinder valve.
3. Observe the supply pressure gage (9) for 2 minutes; no leakage is allowed.

REGULATED HIGH PRESSURE SYSTEM.–The required tests of the regulated high pressure system are performed as follows:

1. Cap the oxygen input connection (18) in the chamber.
2. Turn the supply cylinder valve on and open the shutoff to Q valve (W).
3. Turn the high regulator (Q) to the load position and hold until 2,000 psi is indicated on the regulated high pressure gage (10) (or until the cylinder pressure is reached).
4. The regulated low pressure gage (11) should read: 170 ± 5 psi.
5. Turn off shut off to Q valve (W).
6. Observe the regulated high pressure gage (10) for 2 minutes, no leakage is allowed.
7. If pressure is observed on the oxygen input pressure gage (27), a leak is indicated in the inlet pressure on-off valve (L) or leaking in the on-off valve (G). A pressure drop shown on gage (11) indicates valve (G) is leaking.

NOTE: A later test will test for leakage from the on-off valve (G) independently.



VIEW A
INSIDE CHAMBER

VIEW B
SIDE PANEL

PR.393

A. Input valve.
B. Altitude controller.
C. Output valve.
D. Pressure selector valve.
E. Leakage control valve.
F. Leakage selector valve.
G. Leakage on-off valve.
H. Vent pressure valve.
I. Vent ambient valve.
J. Flutter dampener valve.
K. Chamber bleed valve.
L. Inlet pressure on-off valve.
M. Flow selector valve.
N. Low pressure regulator.
O. Reference pressure selector valve.
P. Controller regulator.
Q. High pressure regulator.
R. Suit simulator reference shutoff valve.
S. Bottle charging valve.
W. Shutoff to Q valve.
X. Pressure control valve.
Y. Vent control valve.
Z. Manometer pressure equalizer.
1. Output flow manometer.
2. Input flow manometer.
3. Vent flow manometer.
4. Pressure suction manometer.
5. HG manometer.
6. Overboard rotameter leakage flowmeter.
7. In-system rotameter leakage flowmeter.
8. In-system rotameter leakage flowmeter.
9. Supply pressure gage.
10. Regulated high pressure gage.
11. Regulated low pressure gage.
12. Altimeter high range indicator.
13. Altimeter low range indicator.
14. 220/440V input connector.
15. O_2 input connector.
16. O_2 filling connector.
17. Pump control switch.
18. O_2 input connection (altitude chamber).
19. Low pressure connection (altitude chamber).
20. 200cc leakage connection (altitude chamber)
21. Reference tap connection (altitude chamber).
22. Input port (altitude chamber).
23. Output port (altitude chamber).
24. Helmet reference tap connection (altitude chamber).
25. Pressure suction manometer.
26. Piezometer.
27. O_2 input pressure gage.
28. Tee connector.
29. Controller set knob.
30. Controller supply gage.
31. Controller altitude gage.
32. Controller output gage.

Figure 18-7.–Oxygen test stand 62-A-116-E1.

Table 18-1.—Purpose and use of instruments and controls.

Control or Instrument	Figure 18-7 Item No.	Purpose	Use
Input Valve.	A	Controls the flow of ambient air through the input Vol-O-Flow element to the input port (22) in the high altitude chamber.	Intercomparison test, orifice calibration test, and oxygen ratio test.
Altitude Controller.	B	Controls direct evacuation of the high altitude chamber through the bypass port.	To evacuate the high altitude chamber bypassing the item under test.
Output Valve.	C	Controls a flow of air, oxygen, or air-oxygen mixture from an item under test through the piezometer (26), through the output connection (23), through the flow selector valve (M), through the output Vol-O-Flow element, to the vacuum pump, to the atmosphere.	To draw a flow or suction from an item under test.
Pressure Selector Valve.	D	Selects or shuts off pressure suction manometer (4).	Tests requiring observations on the pressure suction manometer (4).
Leakage Control Valve.	E	Regulates low pressures at small rates of flow from in-system leakage rotameters to low pressure connection (19) in altitude chamber.	Outward leak tests on various components.
Leakage Selector Valve.	F	Selects low range in-system leakage rotameter (7), or high range in-system leakage rotameter (8).	To determine low or high leakage flows in ccm.

Table 18-1.–Purpose and use of instruments and controls–Continued.

Control or Instruments	Figure 18-7 Item No.	Purposes	Use
Leakage On-Off Valve.	G	Directs oxygen from in-system leakage rotameters (7) or (8), depending on the position of the leakage selector valve (F) to the oxygen input connection (18).	To determine leakage from items connected to the oxygen input connection (18).
Vent Pressure Valve.	H	Controls ventilation flows through the vent flow Vol-O-Flow element to the suit simulator tank at ground level.	Tests requiring ventilation flows to the suit simulator tank at ground level.
Vent Ambient Valve.	I	Controls ventilation flows through the vent Vol-O-Flow element to the suit simulator tank at simulated altitudes.	Tests requiring ventilation flows to the suit simulator tank at altitudes.
Flutter Dampener Valve.	J	Opens the suit simulator tank to the line between the flow selector valve (M) and the output valve (C).	Acts to prevent any flutter of the diaphragm during regulator testing. Allows a flow to be drawn from the item under test with the flow selector valve (M) in the controller position.
Chamber Bleed Valve.	K	Bleeds ambient air directly into the altitude chamber.	To increase pressure in the altitude chamber.
Inlet Pressure On-Off Valve.	L	Directs regulated oxygen directly to the oxygen input connection (18).	To supply items under test with a regulated oxygen supply.
Flow Selector Valve.	M	Select a flow path from the output connection (23) to the suit simulator tank or output valve (C).	Direct flows of oxygen in the proper direction for various components.

Table 18-1.—Purpose and use of instruments and controls—Continued.

Control or Instrument	Figure 18-7 Item No.	Purpose	Use
Low Pressure Regulator.	N	Regulate pressure to the test stand within a range of 0 to 180 psi.	To regulate low pressure to the test stand.
Reference Pressure Selector Valve.	O	References low range altimeter (13) to the altitude chamber or suit simulator.	Same as purpose.
Controller Regulator.	P	Regulates supply pressure to the primary standby altitude controller.	Pressure used to operate the pneumatic valve.
High Pressure Regulator	Q	Regulates the pressure to the test stand within a range of 200 psi to the capacity of the oxygen cylinder.	To regulate the high pressure to the test stand.
Suit Simulator Reference Shutoff Valve.	R	Shuts off or references suit simulator tank to the helmet reference tap (24) and reference pressure selector valve (0).	Allows the helmet reference tap (24) and the reference pressure selector valve (0) to be referenced to the suit simulator tank.
Bottle Charging Valve.	S	Controls regulated oxygen pressure to the oxygen filling connector (16).	Charging various oxygen cylinders and bleeding the test stand.
Shutoff to "Q" Valve.	W	Prevent the supply cylinder pressure from reaching the high pressure regulator (Q) inadvertently.	Allow or prevent cylinder pressure from entering the high pressure regulator (Q).
Pressure Control Valve.	X	Controls the pressure to the pneumatic valve when the standby altitude controller is used.	Used to open and close the pneumatic valve.
Pressure Connection to Inclined Manometer.	X	Connects the pressure line to the inclined pressure suction manometer (25).	Connect the pressure line from the item under test to the pressure suction manometer (25).

Table 18-1.–Purpose and use of instruments and controls–Continued.

Control or Instrument	Figure 18-7 Item No.	Purpose	Use
Vent Control Valve.	Y	Controls venting of the pressure off the standby controller.	To set bleed, allowing the pneumatic valve to open and close.
Suction Connection to Inclined Manometer.	Y	Connects the suction line to the inclined pressure suction manometer (25).	Connects the suction line from the item under test to the pressure suction manometer (25).
Manometer Pressure Equalizer.	Z	Equalizes pressure in the pressure suction manometer (4).	Same as purpose.
Output Flow Manometer.	1	Measures in indicated inches of water the amount of flow through the output Vol-O-Flow element.	Indicates the amount of flow being drawn from the item under test or from the output connection (23).
Input Flow Manometer.	2	Measures in indicated inches of water the amount of flow through the input Vol-O-Flow element.	Indicates the amount of flow being admitted to the altitude chamber through the input port (27).
Vent Flow Manometer.	3	Measures in indicated inches of water the amount of flow through the vent flow Vol-O-Flow element.	Indicates the amount of flow being sent to the suit simulator tank.
Pressure Suction Manometer.	4	Measures in inches of water pressure the amount of differential pressure from the piezometer (26) and altitude chamber or differential pressure from the piezometer (26) and the suit simulator tank.	Measures in inches of water the safety pressure, pressure breathing, and the suction reading during components testing.

Table 18-1.–Purpose and use of instruments and controls–Continued.

Control or Instrument	Figure 18-7 Item No.	Purpose	Use
Mercury Manometer.	5	Measures in inches of mercury the amount of differential pressure from the piezometer (26) and altitude chamber or differential pressure from the piezometer (26) and suit simulator tank.	Measures in inches of mercury resistance in an item under test-pressure applied to an item under test.
Overboard Leakage Rotameter Low Range.	6	Measures in cubic centimeters per minute, leakage, or bleed, from a component through the leak tap (20) in the chamber.	Measures leakage and bleeds from 20-200 ccm.
In-system Leakage Rotameter Low Range.	7	Measures in cubic centimeters per minute, leakage or bleed from a component through the leakage control valve (E) or the leakage on-off valve (G).	Measures leakage and bleeds from 20-200 ccm.
In-system Leakage Rotameter High Range.	8	Same purpose as listed above.	Measures leakage and bleeds from 200-2,000 ccm.
Supply Pressure Gage.	9	Indicates in pounds per square inch pressure in the supply cylinder.	*
Regulated High Pressure Gage.	10	Indicates in pounds per square inch pressure loaded with the high pressure regulator (Q).	Indicates the amount of high pressure applied to the item under test or to the oxygen filling connection (16)
Regulated Low Pressure Gage.	11	Indicates in pounds per square inch pressure of 170 ± 5 psi which is loaded with the low pressure regulator (N).	Indicates the amount of low pressure applied to an item under test, in-system rotameters, or vent pressure valve (H).

Table 18-1.–Purpose and use of instruments and controls–Continued.

Control or Instrument	Figure 18-7 Item No.	Purpose	Use
High Range Altimeter.	12	Measures in thousands of feet and millimeters of mercury the simulated altitude in the altitude chamber within a 30,000 to 150,000 foot-range.	*
Low Range Altimeter.	13	Measures in thousands of feet and millimeters of mercury the simulated altitude in the altitude chamber, or, if selected, suit simulator tank. 10,000 to 40,000 foot-range.	*
220/440V Input Connector.	14	Electrical input supply connector for the vacuum pump motor.	*
Oxygen Input Connector.	15	Connects the oxygen supply cylinder to the test stand oxygen system.	*
Oxygen Filling Connection.	16	Connects the test stand oxygen system to various oxygen cylinders for charging.	Used to bleed the pressure systems of the test stand.
Pump Control Switch.	17	Energizes the vacuum pump motor.	*
Oxygen Input Connection.	18	Connects components to the regulated oxygen supply of the test stand.	*
Low Pressure Connection.	19	Connects components to the leakage control valve (E).	*
20-200 cc Leakage Connection.	20	Connects the components to the overboard leakage control valve (6).	*

Table 18-1.—Purpose and use of instruments and controls—Continued.

Control or Instrument	Figure 18-7 Item No.	Purpose	Use
Reference Tap Connection.	21	A reference connection to the differential pressure indicating manometers (4), and (5).	*
Input Port.	22	A pluggable port to allow a measurable flow of ambient air into the altitude chamber.	*
Output Port Connection.	23	Output port connection from the altitude chamber.	*
Helmet Reference Tap Connection.	24	A tap to reference into the suit simulator reference shutoff valve (R) and reference pressure selector valve (O).	*
Pressure Suction Manometer Inclined.	25	Indicates in inches of water pressure differential pressure from an item under test and test altitude.	To obtain accurate pressure indications at low pressures.
Piezometer.	26	Senses differential pressure from a component connected to it.	When differential pressure indications are required.
Oxygen Inlet Pressure Gage.	27	Indicates in pounds per square inch the amount of regulated low pressure to the oxygen input pressure tap (18). Indicates seating pressure of 145 ± 5 psi gage guard.	*
Oxygen Input Tee Connection.	28	To allow two sizes of high pressure fittings at the input taps.	*
Controller Set Knob.	29	Sets approximate altitude reference point on the altitude controller (B).	All tests requiring evacuation of the high altitude chamber through the bypass port.

Table 18-1.–Purpose and use of instruments and controls–Continued.

Control or Instrument	Figure 18-7 Item No.	Purpose	Use
Controller Supply Gage.	30	Indicates in pounds per square inch the amount of pressure loaded to the supply side of the altitude controller (B) with the controller regulator (P).	All tests requiring use of the vacuum pump.
Controller Altitude Gage.	31	Indicates in feet the approximate altitude to which the high altitude chamber can be evacuated.	All tests requiring evacuation of the high altitude chamber.
Controller Output Gage.	32	Indicates in pounds per square inch the amount of pressure at the altitude controller output.	All tests requiring use of the vacuum pump.

*The use of these items is dependent on the component test being performed.

8. Bleed pressure by turning the high pressure regulator (Q) to vent, load and vent again to insure that the pressure trap between Q and W valve is bled. Open the bottle charging valve (S) and after the pressure is bled, close the bottle charging valve (S).

REGULATED LOW PRESSURE SYSTEM.–The required tests of the regulated low pressure system are performed as follows (If the oxygen supply cylinder is turned off).

1. Turn the oxygen supply cylinder on, place the leakage selector valve (F) to high, and the selector valve (D) to the (Hg) Mercury position.
2. Place the inlet pressure on-off valve (L) and the leakage on-off valve (G) in the on position.
3. Slowly turn inward (clockwise) on the low pressure regulator (N) until a pressure of 70 psi is indicated on the regulated low pressure gage (11), and oxygen input pressure gage (27).
4. Return the inlet pressure on-off valve (L) to the off position.
5. Observe the high range leakage rotameter (8); there is no allowable leakage.
6. Place the leakage selector valve (F) in the low position and observe the low range leakage rotameter (7); there is no allowable leakage.
7. Return the leakage selector valve (F) to high, and the inlet pressure on-off valve (L) to the on position.
8. Slowly adjust the low pressure regulator (N) until 160 psi is indicated on the regulated low pressure gage (11). Pressure indicated on the oxygen input pressure gage (27) should be 145 ± 5 psig.
9. Turn the inlet on-off valve (L) off.
10. Observe the high range leakage rotameter (8); there is no allowable leakage.
11. Turn the leakage selector valve (F) to low.
12. Observe the low range leakage rotameter (7); there is no allowable leakage.

VALVE (E) AND (G) LEAKAGE TEST.–The required steps of valve (E) and (G) leakage tests are performed as follows:

1. Connect a hose from the low pressure connection (19) to the 20 to 200 ccm leak tap (20) in the chamber.

2. Observe the low range overboard rotameter (6); there is no allowable leakage.

3. Turn the leakage on-off valve (G) off and remove the cap from the input pressure tap (18) in the chamber.

4. Observe the low range leakage rotameter (7); there is no allowable leakage.

SUIT SIMULATOR LEAKAGE TEST.–The required procedures on the suit simulator leakage are performed as follows:

1. Open the suit simulator reference shutoff valve (R) and the flutter dampener valve (J) fully.

2. Place the reference selector valve (0) to the altitude chamber and the flow selector valve (M) to the controller position.

3. Remove the hose from the 20 to 200 ccm leak tap (20) and connect to the reference pressure tap (21).

Cap the piezometer (26).

4. Place the pressure selector valve (D) to the H_2O position and the leakage selector valve (F) to high.

5. Open the leakage control valve (E) to maintain 10 inches of water pressure throughout the system as indicated on the pressure-suction manometer (4). With (E) valve fully closed, any further climb in the pressure-suction manometer will indicate a leak through (H) valve. Open (E) valve to maintain 20 inches of water pressure.

6. When the pressure is constant, observe the high range leakage rotameter (8); there is no allowable leakage.

7. Turn the leakage selector valve (F) to low, observe the low range leakage rotameter (7); there is no allowable leakage.

8. Turn the leakage selector valve (F) to high and close the leakage control valve (E), remove the hose from the low pressure connection (19) and allow the pressure to escape from the hose.

NOTE: Open the output valve (C) to aid in relieving the pressure and then close valve (C).

9. When all the pressure is equal, connect the hose to the 20 to 200 ccm leak tap (20) in the chamber.

10. Observe the low range overboard leakage rotameter (6); there is no allowable leakage.

11. Remove the cap from the piezometer (26) and disconnect the hose from the reference tap (21) and the 20 to 200 ccm leak tap (20) in the chamber.

12. Back out (counterclockwise) on the low pressure regulator (N) and bleed the system pressure with the bottle charging valve (S).

13. Close all test stand valves with the exception of the suit simulator reference shutoff valve (R) and the flutter dampener valve (J).

HIGH ALTITUDE CHAMBER AND SUIT SIMULATOR TANK INWARD LEAKAGE TEST.–The required procedures on the high altitude chamber and suit simulator tank inward leakage test are performed as follows:

NOTE: It is recommended that this test be performed weekly.

1. Place the pressure selector valve (D) in the HG position. Insure that the leakage on-off valve (G) and the inlet pressure on-off valve (L) are in the off position.

2. Place the reference pressure selector valve (0) in the suit simulator position.

3. Adjust the controller regulator (P) to 20 psi indicated on the controller supply gage (30). The same pressure should be indicated on the controller output gage (32).

4. Close the chamber door and turn the vacuum pump on.

5. Adjust the controller set knob (29) to 30,000 feet as indicated on the low range altimeter (13). Check that the same altitude is indicated on the high range altimeter (12).

6. Adjust the controller set knob (29) to 40,000 feet as indicated on the low range altimeter (13). Check that the same altitude is indicated on the high range altimeter (12).

NOTE: If indicator (12) and (13) do not agree, refer to the applicable calibration instructions contained in NAVWEPS 17-15BC-11, and adjust as necessary.

7. Adjust the controller set knob (29) to 52,000 feet as indicated on the high range altimeter (12).

8. Reposition the red indicator to a point below zero on the controller altitude gage (31).

9. The controller output gage (32) should indicate 20 psi.

10. After a 2 minute stabilization period, observe the high range altimeter (12), and record the reading.

11. The allowable altitude loss must not exceed 1,000 feet in 20 minutes.

12. Open the chamber bleed valve (K) and return the chamber to sea level.

13. Close the chamber bleed valve (K).

14. Turn off the vacuum pump (never turn the vacuum pump off at altitude).

15. Close the oxygen supply cylinder valve.

16. Back out (counterclockwise) on the controller regulator (P).

17. Adjust the controller set knob (29) to move the red indicator above sea level. This bleeds the altitude controller. Return the red indicator to below sea level.

18. Open the bottle charging valve (S), then turn inward (clockwise) on the low pressure regulator (N) to bleed the system. After the system is bled, back out (counterclockwise) on the low pressure regulator (N).

19. Close all test stand valves.

TESTING OXYGEN REGULATORS

Oxygen regulator testing is a responsibility of the PR. This chapter covers the testing procedures for the Bendix 29252-A-2 regulator and the miniature oxygen breathing regulator type 226-20004.

There are a number of various types of regulators used in the Navy today. The recommended testing procedures for these regulators can be found in their respective Overhaul Instructions Manuals. All regulators must be tested before they are installed in an aircraft. They are also tested any time they are disassembled for repair or adjustment and periodically at intervals specified in the appropriate manuals.

BENDIX 29252-A-2 OXYGEN REGULATOR

The Bendix 29252-A-2 regulator is one of the latest and most compact diluter demand pressure breathing automatic safety pressure regulators to be developed. It is also the first seat mounted regulator, and is used both in flight and in case of emergency. It is designed to be used with the A13-A oxygen mask. It is constructed so that with a normal inlet pressure of 70 psi, it will deliver diluted oxygen from sea level up to approximately 30,000 feet. One hundred percent oxygen is automatically delivered up to 50,000 feet, which is the service ceiling of the regulator. The regulator delivers automatic safety pressure, not in excess of 2 inches of water pressure, from sea level up to 35,000 feet. It delivers automatic pressure breathing from 35,000 feet to 50,000 feet, not to exceed 18 inches of water pressure.

All tests on the Bendix 29252-A-2 regulator are conducted with the regulator in the horizontal plane and the air dilution control knob down. The following tests are conducted on the oxygen regulator test stand, OTS-565AM. Figure 18-8 is a cutaway view of the Bendix 29252-A-2 regulator.

Overall Leakage Test

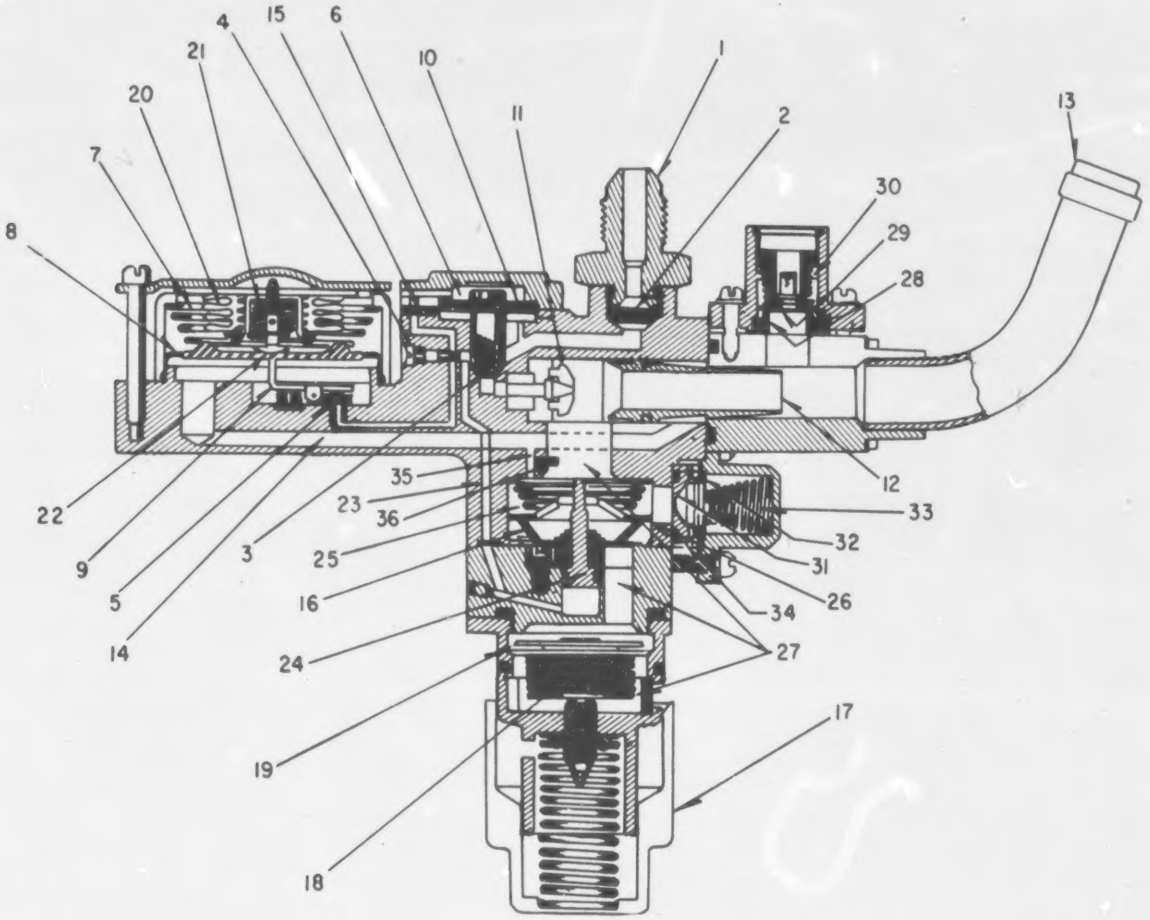
Place the diluter control knob on 100 percent and cap the outlet port. Apply 70 psi inlet pressure, then soap the mating surfaces of the inlet fittings and regulator body. There should be no evidence of leakage.

Relief Valve Test

Place the diluter control knob on normal and cap the inlet port. Apply 16 inches of water pressure at the outlet of the regulator. The maximum allowable leakage is 0.01 lpm. Apply 24 inches of water pressure. The relief valve must vent 40 lpm at a pressure no greater than 24 inches of water pressure. Decrease the pressure at the outlet to 15 inches of water pressure. There should be no evidence of leakage.

Automatic Safety Pressure Test

Mount the regulator in the test stand. Insure that the mask flow line is connected to the regulator outlet. Place the diluter control knob on normal and apply 75 psi inlet pressure. Record the pressure-suction manometer reading on a performance sheet. The pressure-suction manometer reading must not exceed 2 inches of water pressure. Record the pressure of the suction manometer reading on the performance sheet for flows of 0, 70, and 100 lpm at sea level and 34,000 feet. To ascend in altitude, open the outlet valve to indicate 10 lpm flow and control the ascent with the bypass valve. For flows of 100 lpm the pressure-suction manometer must not exceed 2 inches water pressure nor drop below -2 inch water pressure.



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1. Inlet fitting.
2. Inlet filter.
3. Demand valve.
4. Needle valve.
5. Pilot valve.
6. Upper D. V. chamber.
7. Safety press. spring.
8. Breathing diaphragm.
9. Pilot valve lever.
10. Demand valve diaphragm.
11. Nozzle.
12. Venturi.
13. Outlet fitting.
14. Sensing line.
15. Restricting orifice.
16. Check valve.
17. Dilution knob.
18. Air ratio aneroid.
19. Throttling plate.
20. Press. breathing aneroid.
21. Max. press. spring.
22. P. B. contact screw.
23. Inlet press. chamber.
24. Piston.
25. Return spring.
26. Spring retainer.
27. Air dilution port.
28. Relief valve seat.
29. Relief valve plate.
30. Relief valve spring.
31. Dump valve seat.
32. Valve plate and diaphragm.
33. Dump valve spring.
34. Exhaust holes.
35. Booster hole.
36. Adjusting screw.

Figure 18-8.—Cutaway view of Bendix 29252-A-2 regulator.

Return to sea level, place the dilution control knob on 100 percent, and record the pressure of the pressure-suction manometer reading on the performance sheet for flows of 0, 70 and 100 lpm at sea level, and 34,000 feet. Decrease the inlet pressure to 40 psi, maintain 34,000 feet altitude, and record the pressure-suction manometer reading for flows of 0 to 55 lpm at 34,000 feet and sea level. The recorded pressure must not exceed 2.0 inches of water pressure.

Oxygen Ratio Test

Place the diluter control knob on normal and set the inlet pressure on 75 psi. Open the outlet valve and ascend to the first altitude on the performance sheet. Adjust the outlet valve for the required test flows. Adjust the inlet valve to maintain the correct test altitude. Record the input manometer reading on the worksheet for all flows on the oxygen ratio table. Repeat the above step for all test altitudes and flows on the oxygen ratio table.

NOTE: The bypass valve must be opened to climb above the aneroid closure altitude.

Check Valve Test

Place the diluter control knob on normal and set the inlet pressure to 40 psi. Ascend to test altitude (20,000 feet) and adjust the outlet valve for the required flow of 30 lpm. Adjust the inlet valve to maintain correct test altitude. Record the input manometer reading. Readjust the inlet pressure to 25 psi and adjust the outlet valve for required flow of 30 lpm. Adjust the inlet valve to maintain the correct test altitude. Record the input manometer reading on the worksheet.

Pressure Breathing Test

Place the diluter control knob on normal. Set the inlet pressure to 75 psi. Adjust the outlet valve to indicate 10 lpm. Open the bypass valve and ascend to the first test altitude on the worksheet. Record the pressure-suction manometer. The pressure-suction manometer reading must fall between the minimum and maximum on the positive pressure table. Repeat the test for each altitude in the positive pressure table.

MINIATURE OXYGEN BREATHING REGULATOR 226-20004

The 226-20004 oxygen breathing regulator is mounted on the mask for use both in flight and bailout or emergency. The regulator is used with the A13A oxygen mask. It can be chest, mask, or mounted over the shoulder. The assembly weighs 2.3 ounces and is about 2 5/8 inches in length and 2 5/8 inches in width. It is designed so that with an inlet pressure of 40 to 90 psig it will deliver 100 percent oxygen automatically to the user between the altitudes of 0 and 50,000 feet. The regulator incorporates automatic safety pressure buildup to a maximum of 2 inches of water pressure below 35,000 feet and automatic pressure breathing for altitudes about 35,000 feet. Figure 18-9 shows a cutaway view of the 226-20004 oxygen breathing regulator.

Bench Testing the 226-20004 Regulator

Inspect the inlet port of the regulator for loose screws. Secure all loose screws and apply glyptol to screwheads so that the screws do not tend to loosen. The regulators must be subjected to the following tests every 60 days.

Overload Test

Cap the inlet of the regulator. Apply a pressure of 25 inches of water pressure to the outlet of the regulator for 2 minutes. The following test will indicate any failure.

Body Leakage Test

Plug the inlet of the regulator and apply a pressure of 10 inches of water pressure to the outlet of the regulator. Leakage must not exceed 20 cc/minute.

Demand Valve Leakage Test

Apply a pressure of 150 psig to the inlet of the regulator. Maintain a static flow condition at sea level for 5 minutes. After 5 minutes the regulator outlet pressure must not have exceeded 2 1/2 inches of water pressure on the pressure-suction manometer, nor dropped below 0 inches of water pressure.

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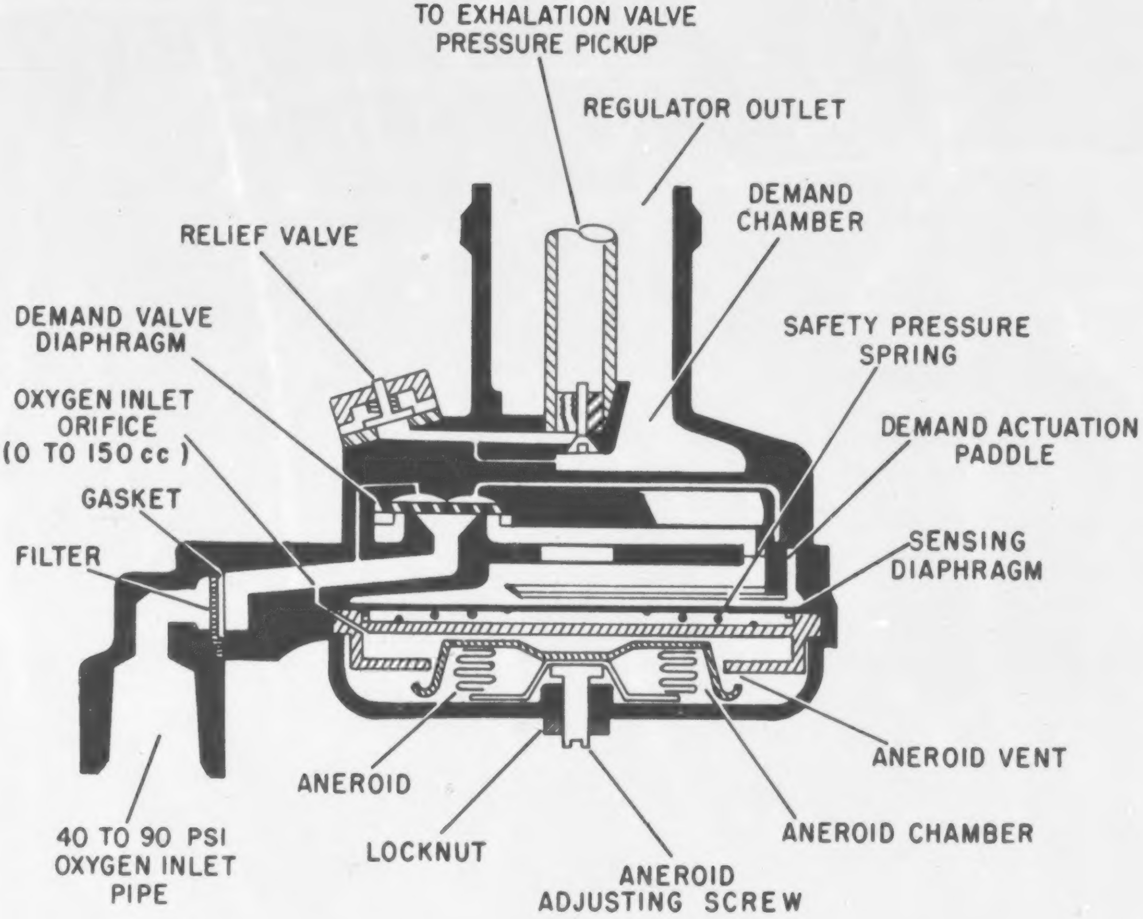
TO EXHALATION VALVE PRESSURE PICKUP
REGULATOR OUTLET
DEMAND CHAMBER
RELIEF VALVE
DEMAND VALVE DIAPHRAGM
SAFETY PRESSURE SPRING
OXYGEN INLET ORIFICE (0 TO 150 cc)
DEMAND ACTUATION PADDLE
GASKET
FILTER
SENSING DIAPHRAGM
ANEROID VENT
ANEROID
ANEROID CHAMBER
40 TO 90 PSI OXYGEN INLET PIPE
LOCKNUT
ANEROID ADJUSTING SCREW

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Figure 18-9.—Cutaway view of the 226-20004 regulator.

Automatic Safety Pressure Test

Set up the regulator, making sure that the regulator outlet and piezometer restrictor are 1 inch apart. Remove the rubber tube from the regulator outlet. Set the inlet pressure to 40 psig. Record the readings on the pressure suction manometer at flows of 0 and 70 lpm. Set the oxygen inlet pressure at 50 psig on the pressure gage located within the altitude chamber. Record the pressure indicated on the pressure-suction manometer for regulator outlet flows of 0 and 100 ambient liters per minute at sea level, 10,000, and 30,000 feet. Use valves A and B to regulate chamber ascent and descent respectively, and valve C as the regulator outlet flow control valve. Repeat the test with the oxygen inlet pressure set at 90 psig on the oxygen pressure gage located within the altitude chamber.

NOTE: The recorded pressures for the tests discussed in the preceding paragraph must not go negative nor exceed 2 inches of positive water pressure.

Automatic Positive Pressure Breathing Test

With the regulator still set up in the test stand, set the oxygen inlet pressure on the oxygen gage within the altitude chamber at 40 psig. With a flow of 10 liters per minute, vary the altitude from sea level to 43,000 feet. Record the altitude at which the automatic positive pressure breathing device cuts in. This point will be evident when the pressure-suction manometer reading increases above 2 inches of water pressure. The cut-in point must be between 35,000 and 39,000 feet.

Increase the simulated altitude to 43,000 feet with the flow remaining at 10 lpm. Record the positive pressure maintained by the regulator. Adjust the flow to 100 lpm and record the positive pressure maintained by the regulator. The pressure must not exceed 12.5 inches of water nor be less than 9.2 inches of water at 43,000 feet. Repeat the same test with 90 psig applied to the regulator.

Maximum Pressure Control

Cap the pressure pickup tube in the regulator.

Set the oxygen inlet pressure on the oxygen gage within the altitude chamber at 90 psig. With an ambient flow of 10 lpm evacuate the chamber to 50,000 feet altitude. Record the outlet pressures at 0 and 100 ambient lpm from the pressure-suction manometer. The maximum pressure control point occurs when the pressure-suction manometer indicates a constant outlet pressure. The maximum pressure control must not allow the positive pressure to exceed 18 inches of water at 50,000 feet. The relief valve is the maximum pressure control device for this regulator.

EMERGENCY OXYGEN SYSTEMS

The purpose of the emergency oxygen system is to administer breathing oxygen necessary for sustaining aircrewmen during high-altitude operations under emergency conditions. There are a number of various types and configurations of oxygen bailout bottles contained within the parachute seat pans. This section will cover those emergency oxygen systems configured with the SP-1A, Firewel, and Douglas seat pans.

These seat pans are designed for use with both ejection and nonejection seats and function as a seat for the aircrewman as well as a container for an emergency oxygen system. Flexible oxygen hoses provide connection between the aircrewman and the aircraft. In the event of a failure of the aircraft oxygen system, emergency oxygen is available by pulling the manual oxygen release located on the seat pans. Oxygen from the seat pans then flows to the aircrewman through the reducer in the seat pans. A check valve in the manifold prevents emergency oxygen from flowing into the aircraft system or overboard from the seat pans. The reducer is automatically activated at ejection by a cable attached to the cockpit deck.

SP-1A OXYGEN SYSTEM

The SP-1A oxygen system is a component of the SP-1A Seat Pan. A flexible oxygen hose provides for the connection between the aircrewman and the oxygen bottle. When the manual oxygen release is pulled, oxygen flows to the aircrewman through a metering orifice. Oxygen is activated only by the manual oxygen release; as no automatic feature is incorporated, the aircrewman must pull the oxygen release on bailout. (See fig. 18-10.)

A function check of the SP-1A must be performed at each aircraft calendar check. To perform the required check, proceed as follows:

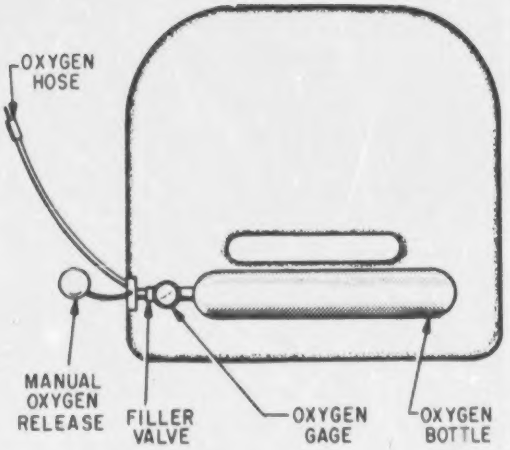
1. Charge the oxygen bottle to 2,100 psi and submerge the bottle in water for at least 5 minutes. A release of air bubbles from the hose or valve after 1 minute is not allowed.

NOTE: Do not submerge the bottle's oxygen gage or pull cable assembly in water. The proper procedure is shown in figure 18-11.

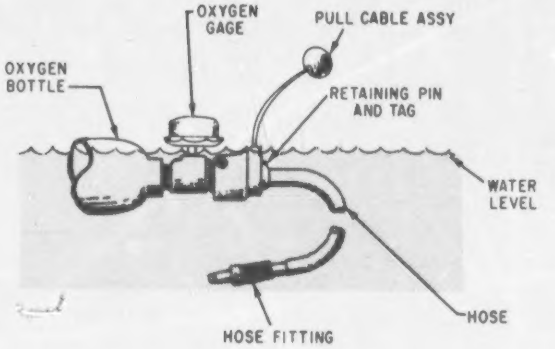
2. Dry the oxygen assembly with dry, clean, compressed air.

The test stand may be used to charge the emergency oxygen system. To charge, proceed as follows:

1. Insure that all safety precautions are strictly adhered to.



PR.372
Figure 18-10.—Oxygen schematic (SP-1A).



PR.373
Figure 18-11.—Water submersion leak test of the SP-1A oxygen bottle.

2. Insure that the reducer is closed.

3. Remove the filler valve cap and install the filling adapter. Tighten the filling adapter only tight enough to make leak tight; do not over torque.

4. Connect the high pressure oxygen hose to the oxygen filling connection (16) on the test stand.

5. Turn on the oxygen supply cylinder and insure that the gage (9) indicates 2,000 psi or above.

6. Open valve (S) and turn inward slightly on regulator (N) until a slight flow of oxygen passes *through the high pressure hose and purges the* oxygen filler hose.

7. Back out on regulator (N) and close valve (S).

8. Connect the high pressure oxygen filler hose from the filling connection (16) to the filling adapter.

9. Open valve (S) and shut off to Q valve (W).

10. Turn and hold regulator (Q) to the load position until 500 psi is indicated on gage (10).

NOTE: Allow no less than 3 minutes for each filling stage and 2 minute intervals for cooling between stages.

11. Repeat step 10 for 1,000, 1,500, and 2,000 psi.

12. Turn regulator (Q) to the vent position and hold until all pressure on gage (10) is bled.

13. Turn the shutoff to Q valve (W) off.

WARNING: Insure that the filler valve is not turning as the filling adapter is removed. Serious injury could result.

14. Loosen the filling adapter until all pressure is bled from the high pressure line.

15. Remove the filling adapter from the filler valve and close valve (S).

16. Install the cap on the filler valve.

FIREWEL AND DOUGLAS OXYGEN SYSTEMS

On the Firewel and Douglas seat pans, when the aircrewman ejects from the aircraft, the reducer is activated by the automatic oxygen lanyard on seat movement and emergency oxygen is provided for parachute descent. If automatic actuation fails on the Firewel and Douglas seat pans, actuation may be obtained by pulling the manual oxygen release. (See figs. 18-12 and 18-13.)

A functional check of the Firewel and Douglas oxygen systems must be performed at each aircraft calendar check. To perform the required checks proceed as follows:

NOTE: Insure that the emergency oxygen systems are charged to 1,800 psi.

1. Connect the oxygen outlet hose of the seat pan to fitting (18) (fig. 18-7) and insure that all test stand valves are closed.

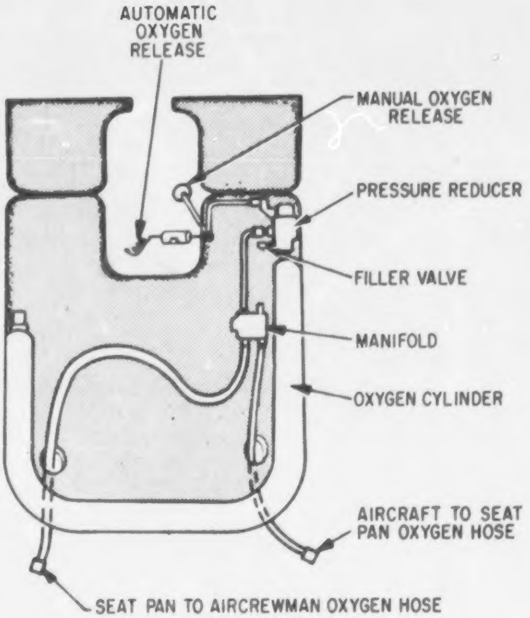

AUTOMATIC OXYGEN RELEASE
MANUAL OXYGEN RELEASE
PRESSURE REDUCER
FILLER VALVE
MANIFOLD
OXYGEN CYLINDER
AIRCRAFT TO SEAT PAN OXYGEN HOSE
SEAT PAN TO AIRCREWMAN OXYGEN HOSE

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Figure 18-12.–Oxygen schematic (Firewel).

2. Measure the force required to activate the emergency oxygen system with the manual oxygen release by using a spring scale. The force required should be 10 to 30 pounds, and gage (27) should indicate 45 to 80 psi.

3. Turn the oxygen supply cylinder to the test stand on.

4. Slowly open valve (L) on the test stand.

5. Using regulator (N), adjust the pressure on gage (11) and (27) to 90 psi.

6. Measure the force required to activate the emergency oxygen system with the manual oxygen release by using a spring scale. The force required should be 10 to 30 pounds.

7. Using a leak test compound, check all pressure lines and fittings for leakage. No leakage is allowed.

8. Reset the reducer; do not increase the oxygen pressure above 150 psi.

9. Using regulator (N), increase pressure until the relief valve unseats. Unseating can be determined by listening and observing gage (27) on the test stand.

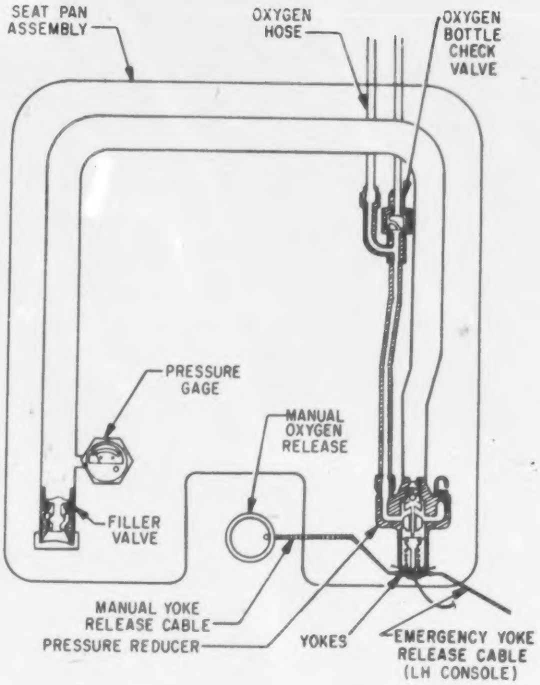
SEAT PAN ASSEMBLY
OXYGEN HOSE
OXYGEN BOTTLE CHECK VALVE
PRESSURE GAGE
MANUAL OXYGEN RELEASE
FILLER VALVE
MANUAL YOKE RELEASE CABLE
PRESSURE REDUCER
YOKES
EMERGENCY YOKE RELEASE CABLE (LH CONSOLE)

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Figure 18-13.–Oxygen schematic (Douglas).

10. Repeat step 9 several times to establish a correct pressure. The relief valve must unseat at 110 to 130 psi, and reseat at 110 psi and be leak tight.

NOTE: Pressure may be reduced below the opening pressure of the relief valve by backing out on regulator (N) and opening valve (S).

11. Close the test stand oxygen supply cylinder and bleed the oxygen pressure from the system by opening valve (S). All pressure is bled when the pressure gage (27) indicates no pressure.

12. Close valve (S) and back out on regulator (N) and shut off valve (L).

13. Close all test stand valves.

14. Measure the force required to disengage the automatic oxygen release by using a spring scale. The force required should be 10 to 30 pounds, and the emergency oxygen system must activate and indicate 45 to 80 psi on gage (27).

15. Reset the reducer.

16. Turn valve (L) on and open valve (S) to bleed the pressure.

17. When the pressure is bled, as indicated by no pressure on gage (27), close valve (S) and turn off valve (L).

NOTE: Observe gage (27) for 2 minutes. Any pressure rise will indicate leakage in the valve seat of the reducer.

18. From the vent flow graph, convert flows for a 20, 40, 60, and 90 actual LPM to indicate inches of water at sea level.

19. Turn valve (L) on.

20. Turn valve (M) to controller.

21. Insure that 1,800 psi is in the oxygen cylinder of the seat pan.

22. Pull the manual oxygen release. Oxygen pressure on gage (27) must indicate 45 to 80 psi.

23. Open valve (H) to indicate the equivalent of 20 LPM on manometer (3). Oxygen pressure must indicate 45 to 80 psi on gage (27).

24. Repeat step 23 at the equivalent of 40, 60, and 90 LPM. Upon completion of checking the 90 LPM flow, close valve (H).

25. Observe the emergency oxygen cylinder pressure gage and bleed the pressure down to 250 psi by opening valve (H).

NOTE: When the needle of the cylinder pressure gage is between the E and F of REFILL, this position is approximately 250 psi.

26. Repeat steps 23 and 24 with the emergency oxygen cylinder at 250 psi and below.

27. Disconnect the seat pan from the test stand.

For more detailed information concerning emergency oxygen systems refer to Survival Kits and Items Manual, NavAir 13-1-6.3.

PURGING

If the emergency oxygen system is contaminated or if the cylinder has remained empty for more than 2 hours, the system must be purged as described in the following steps:

1. Deplete the emergency oxygen cylinder if necessary.

2. Connect a nitrogen source to the oxygen cylinder filler valve, and close the pressure reducer.

3. Slowly pressurize the cylinder to 500 psi with nitrogen at a temperature of 110 degrees C, using an electrical heater.

4. Turn off the nitrogen source and deplete the oxygen cylinder.

5. Repeat steps 3 and 4 twice.

6. With the pressure reducer open, turn on the nitrogen source and purge for 10 minutes at a temperature of 110 to 130 degrees C.

7. Turn off the nitrogen source and disconnect the oxygen cylinder.

8. Connect an oxygen source to the cylinder filler valve and reset the pressure reducer.

9. Slowly pressurize the oxygen cylinder to 500 psi.

10. Deplete the cylinder to 50 psi.

11. Turn off the oxygen source and disconnect the oxygen cylinder.

To charge the emergency oxygen system proceed as follows:

NOTE: If the oxygen cylinder remains empty for longer than 2 hours, the cylinder must be purged prior to charging.

1. Remove the cap on the filler valve of the pressure reducer and connect the oxygen supply to the filler valve, using a suitable pressure regulator and shutoff valve.

NOTE: Observe the filling stages, as rapid application of oxygen creates heat which may result in fire or explosion.

2. Charge the emergency oxygen system in stages in accordance with table 18-3 until the pressure gage on the seat pan indicates 2,000 psi (when the needle on the gage bisects the second L of FULL).

Table 18-3.–Charging stages.

Stage	PSI
1	500
2	1,000
3	1,500
4	2,000

Allow no less than 3 minutes for each filling stage and 2 minute intervals for cooling between stages.

If the emergency oxygen system is to be stored or shipped, fill the cylinder to 200 psi (when the needle on the gage bisects the E of REFILL).

3. Remove the oxygen supply and install a cap on the filler valve of the pressure reducer.

CHAPTER 19

RIGID SEAT SURVIVAL KITS

Rigid seat survival kits (RSSK) are designed for use with ejection seats and they function as a seat for the aircrewman as well as a container for an emergency oxygen system, life raft, and survival equipment.

Rigid seat survival kits are available in various types and configurations from separate manufacturers; in general, parts are not interchangeable between the different manufacturers. Care must be taken to insure that the proper parts breakdowns are used when servicing a kit or ordering replacement components.

The rigid seat survival kits discussed in this chapter are as follows:

1. RSSK-1 and 1A
2. RSSK-2
3. RSSK-5
4. RSSK-6
5. RSSK-8A
6. RSSK-9

RSSK-1 and 1A

The RSSK-1 and 1A are part of the survival equipment used by aircrewman aboard the F-4 series aircraft.

CONFIGURATION

The RSSK-1 and 1A is constructed of a bonded fiberglass body and an extruded metal lip interconnecting the upper and lower container. The kit is opened by use of the yellow and black striped kit release handle mounted on the aft right side. Two adjustable retaining straps on the upper container provide for attachment of the kit to the aircrewman's torso harness. The upper and lower quick-disconnect blocks, interconnected by an intermediate block permanently mounted on the aft left side of the upper container, provides the connection for communications, suit ventilation, oxygen, and anti-g functions between the aircraft and aircrewman.

In the event of a failure of the aircraft oxygen system, emergency oxygen is available by pulling the manual oxygen release on the kit. The RSSK-1 and 1A assemblies are shown in figure 19-1.

Oxygen from the kit then flows to the aircrewman through the emergency oxygen system reducer in the kit. A check valve in the intermediate block prevents emergency oxygen from flowing out of the bottom of the intermediate block when the lower block has been separated. It also prevents the aircraft oxygen from flowing overboard if the upper block is separated and the aircraft oxygen on-off valve is on.

The reducer/manifold is automatically operated by separation of the lower quick-disconnect block from the intermediate block during ejection. The upper container houses the emergency oxygen supply; the lower container houses the life raft and survival equipment. Basic survival items packed in the various configurations of RSSK's will be discussed in Chapter 15 of this manual.

When seated aboard the aircraft, the aircrewman connects the kit quick-release fittings on his retaining straps to his torso harness. The personal service leads are connected via the quick-disconnect upper block. These leads can be quickly disconnected by pulling the leads one at a time or by removing the upper block.

When the aircrewman ejects from the aircraft, the following functions occur:

1. The lower block is separated from the kit at the intermediate block. As the block separates, the reducer/manifold is activated and the aircrewman is provided oxygen for descent.

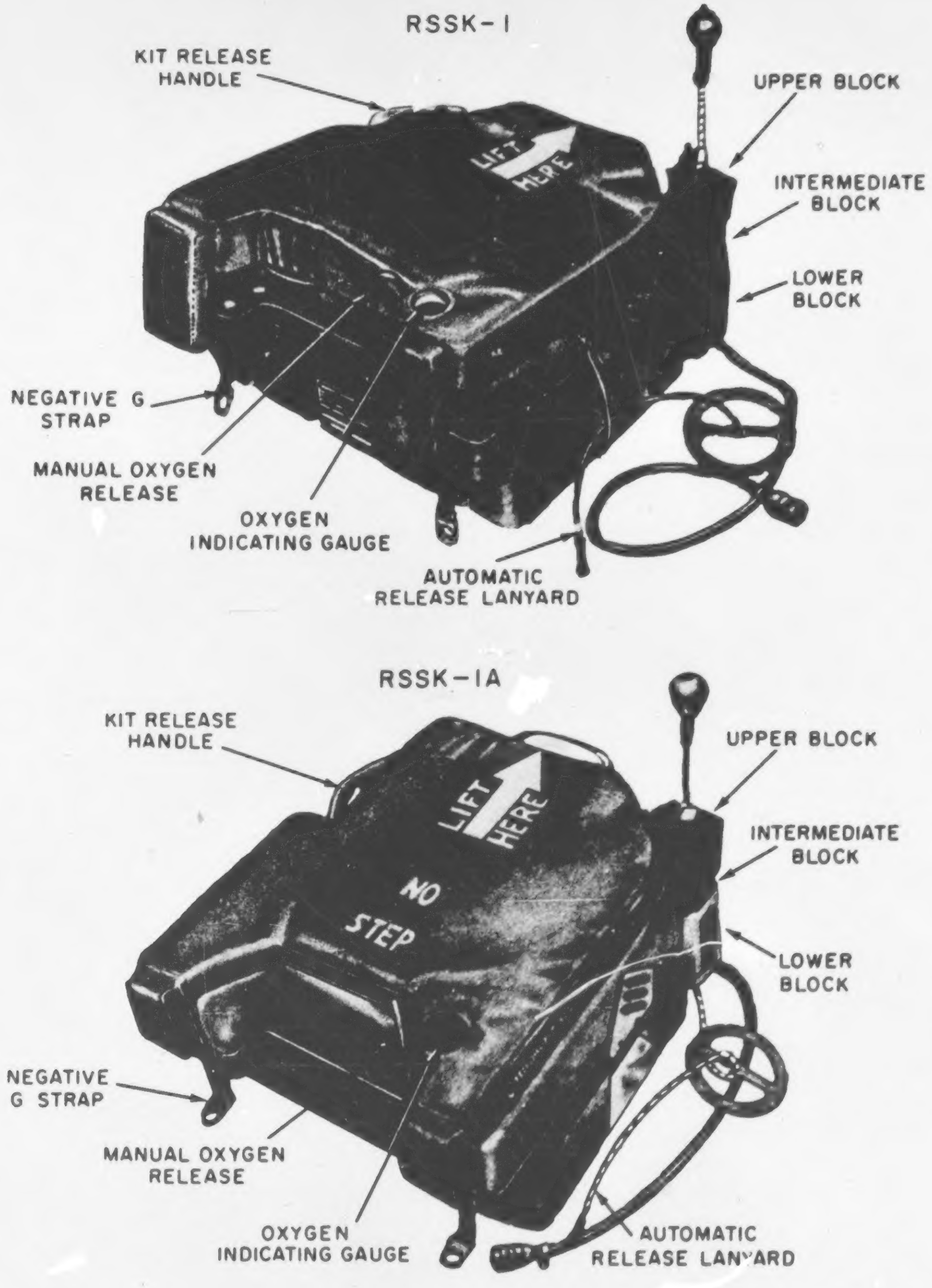
RSSK-1
KIT RELEASE HANDLE
UPPER BLOCK
INTERMEDIATE BLOCK
LOWER BLOCK
LIFT HERE
NEGATIVE G STRAP
MANUAL OXYGEN RELEASE
OXYGEN INDICATING GAUGE
AUTOMATIC RELEASE LANYARD
RSSK-1A
KIT RELEASE HANDLE
UPPER BLOCK
INTERMEDIATE BLOCK
LOWER BLOCK
LIFT HERE
NO STEP
NEGATIVE G STRAP
MANUAL OXYGEN RELEASE
OXYGEN INDICATING GAUGE
AUTOMATIC RELEASE LANYARD

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Figure 19-1.–RSSK-1 and 1A assembly.

NOTE: If automatic actuation of the emergency oxygen fails, oxygen may be manually activated by pulling the manual oxygen release.

2. When deployment is desired, the aircrewman pulls the kit release handle. The lower container falls away but remains attached to the upper container by the dropline. The life raft, attached to the dropline, is automatically inflated.

For information concerning updating and modifications applicable to the RSSK assemblies refer to the Aviation-Crew Systems Manual, Survival Kits and Items, NavAir 13-1-6.3.

RIGGING AND PACKING

Unless operational requirements demand otherwise, rigging and packing of the RSSK-1 and 1A will be accomplished at the intermediate level of maintenance by qualified personnel.

Rigging and packing procedures are accomplished in five operations:

1. Preliminary procedures.
2. Stowing the dropline.
3. Stowing the survival items.
4. Folding, rigging, and packing of the life raft.
5. Closing the container.

Preliminary Procedures

Insure that any RSSK and components to be repacked are inspected in accordance with information discussed later in this section.

Position the RSSK so that the upper and lower containers are alined. Insure that the dropline is attached to the upper and lower container. Insure that the equipment container lanyards are attached. Fabricate a dropline measuring 26 feet, 4 inches, plus or minus 2 feet.

Insure that the raft has been inspected. Insure that the battery and beacon have been tested. Check the interior of the kit for security of the dropline, cables and fittings for corrosion, crushed conduits, loose terminal fittings, and security of the beacon bracket.

Stowing the Dropline

To stow the dropline in the boots, proceed as follows:

NOTE: The numbers on the stowage channels at the boots correspond to the dropline bights and the order in which they are to be stowed. The numbers appearing in figure 19-2 are for clarity only; the numbers do not actually appear on the stowage boots.

1. Form a bight 5 inches from the base of the small loop stitching (the bight should be in the portion of the dropline going to the upper container). With boot B positioned as shown in figure 19-2, (behind the lower container), stow the bight in the channel. Push the bight into the channel with a 7 inch length of 3/8 inch hardwood dowel with rounded and smoothed ends. There should be a 1/2 inch protrusion at the end of the channel.
2. The second bight should be formed in the portion of the dropline going from the small loop to the large loop and it should be stowed in channel number 2. All the lines to the small loop should now be stowed.
3. Place a half-twist in the dropline so that the large loop faces up. Stow the third bight in channel number 3. All lines to the large loop should now be stowed.
4. Stow the remainder of the dropline in the boot in accordance with the numbering sequence on the boots as shown in figure 19-2, maintaining the 1/2 inch protrusion. The final dropline bights should exit the boots as shown in figure 19-2.
5. Form bight 11, in the dropline 15 to 17 inches from the bottom of the last bight in boot B. Stow the bight in channel 11. There should be 6 to 8 inches of dropline between boots A and B when bight number 11 is stowed.
6. Continue stowing the bights in boot B until all of the line is stowed. Maintain the 1/2 inch protrusions. Do not twist the lines in the stows.
7. Remove all twists from the dropline as necessary.

Stowing the Survival Items

To stow the survival items, proceed as follows:

1. Using approximately ten feet of nylon cord, type I, tie all of the survival items together.

NOTE: The word exposed on the beacon slider switch indicates the condition of the beacon. Insure that the switch is OFF.

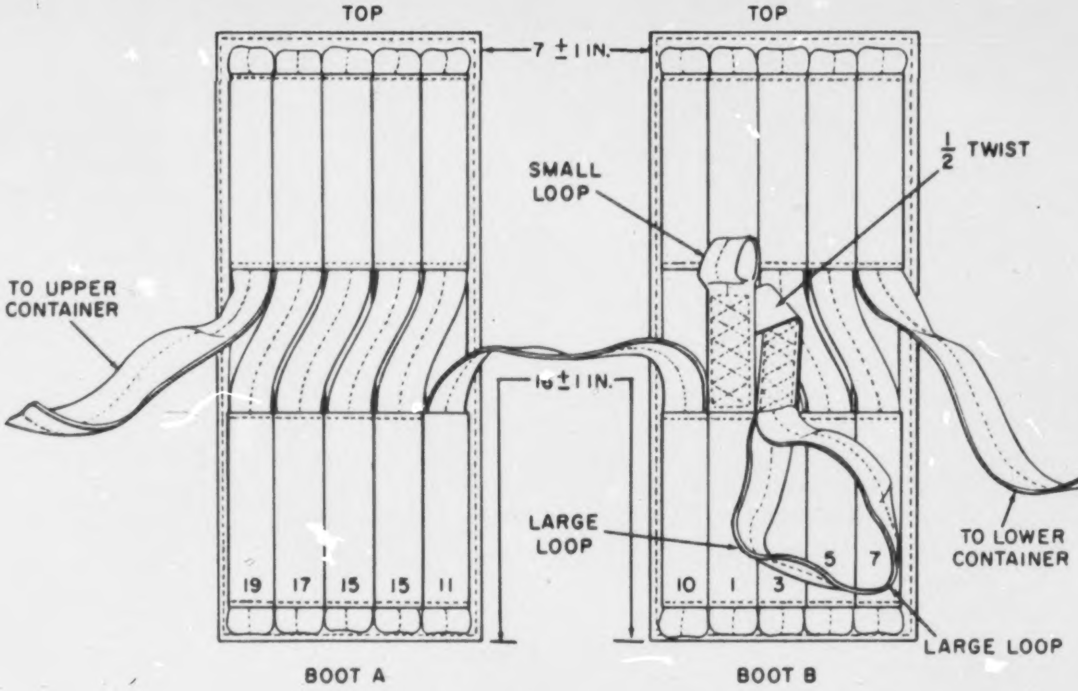

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Figure 19-2.—Stowage of the dropline.

2. Remove the automatic activation plug and remove and discard the retrieval and automatic activation lanyard from the beacon.

3. Remove the threaded metal insert from the beacon with a T-wrench.

4. This step (4) applies only when automatic actuation of the beacon is desired. Remove the cotter pin from the actuator indicator, attach a loop of actuation lanyard to the cotter pin, and reinstall the cotter pin to the actuator indicator.

NOTE: Connection of the other end of the lanyard will be discussed later in this section.

5. Connect the flexible wire antenna to the beacon.

NOTE: Speed in compliance with steps 6 and 7 are important as the beacon is ON and transmitting.

6. Turn the beacon switch ON, install the beacon into the bracket and secure it with hook and pile tape.

7. Insert the actuator indicator through the hole in the container and screw it into the container. This action prevents transmitting.

8. Route the antenna.

9. Install the survival items in the equipment container, close the slide fastener and tie the free end of the nylon cord from the survival items to the slide fastener.

10. Place the equipment container in the forward part of the lower kit container with the slide fastener facing forward in the container. Route the antenna as required.

11. Reeve the hold down straps across the top of the equipment container. Stow any excess straps in the voids (RSSK-1A only); do not knot or tack the hold down straps.

NOTE: All tacking cord must be coated with a mixture of 50 percent beeswax and 50 percent paraffin. The cord may be dipped in a melting

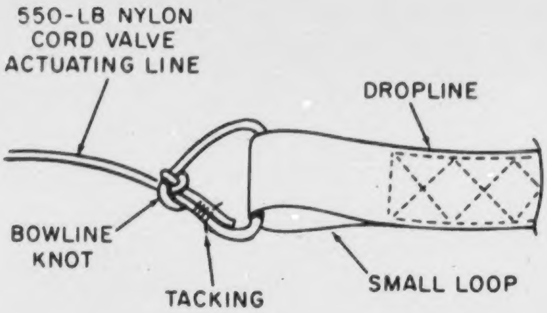


Figure 19-3.—Attaching the valve actuating line.

pot at 160° to 200° F or drawn across a solid block of the wax mixture.

12. Pass the equipment container lanyards around the equipment container hold down straps from the inside, and tie the lanyards to the webbing loops located on the aft corners of the equipment container using a bowline knot.

Tack the end of the knot to the bowline knot loop using two turns of waxed nylon 6-cord, single. Tie the ends with a surgeon's knot followed by a square knot.

13. Insert the boots into the bottom of the container with the dropline facing up.

Folding, Rigging And Packing The LR-1 Liferaft

To fold, rig and pack the LR-1 liferaft, proceed as follows:

1. If the valve actuating line is damaged, incorrectly installed, or not installed, install a new line in accordance with steps 2 and 3.

2. Cut a 15-inch length of 550-pound nylon cord, type III, and sear the ends.

3. Route one end of the line through the small loop on the dropline and tie a bowline knot, as shown in figure 19-3.

Make the tacking with three turns of waxed, size E nylon thread, single. Tie the ends with a surgeon's knot followed by a square knot.

4. Position the upper and lower containers side by side, with the upper container on the opposite side of the release handle of the lower container. Place the boots aft of the lower container.

Fake the retaining line attached to the neck of the carbon dioxide cylinder and stow the line in the raft retaining line pocket. Close the pocket closure tab and mate the hook and pile tape patches.

5. Fold the raft as shown in figure 19-4.

6. The maximum width of the folded raft should not exceed the width of the cover. Adjust the raft folds as necessary.

7. Place the raft behind the lower container with the carbon dioxide cylinder on the raft end closest to the container and the valve assembly facing the release handle.

8. Remove bight number 3 from the boot with the loops.

NOTE: Do not loosen or attempt to remove the carbon dioxide cylinder from the valve assembly.

9. Unscrew the valve from the raft. Do not remove the cylinder from the pocket or the antichafing disk from the inlet check valve.

10. Attach the large loops around the neck of the valve at the cylinder end with a double cord hitch knot. Pull the knot tight. Tack the knot with two turns of waxed nylon 6-cord, single. Tie the ends with a surgeon's knot followed by a square knot.

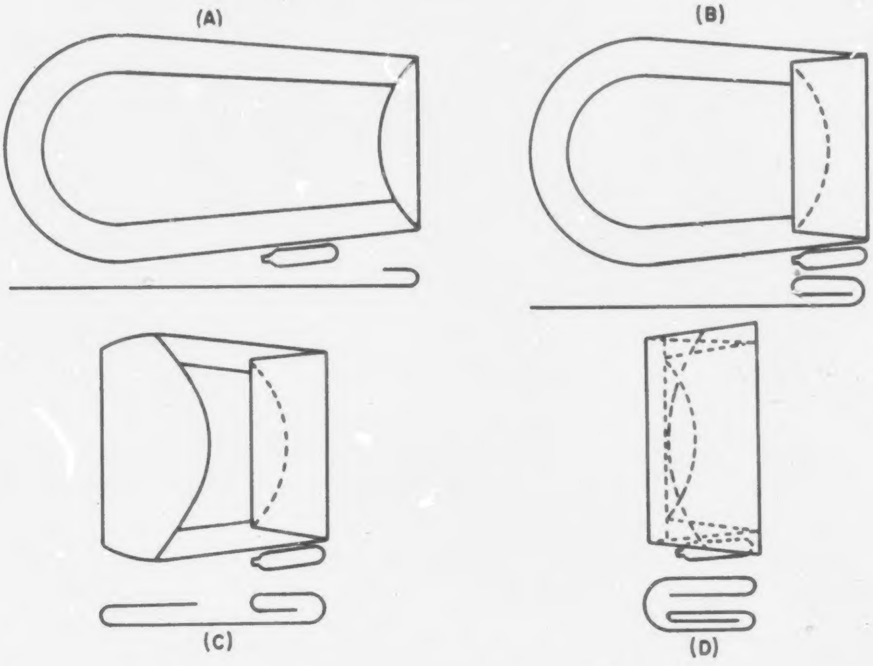
11. Attach and tighten the valve to the raft.

12. Pass the actuating line through the small loop in the end of the pull cable. Tie a loop using a bowline knot. Tack the knot with three turns of waxed, size E nylon thread, single, tie the ends with a surgeon's knot followed by an overhand knot. The finished length of the actuating line should not exceed 5 inches. (See fig. 19-5.)

13. Stow the bight that was removed in step 8. The bight should not extend the full length of the channel.

14. With the carbon dioxide cylinder in place over the bracket, press the raft firmly into the aft end of the container and fold the raft into the container. (See fig. 19-6.)

15. Place the cover over the raft and tuck it in around the raft. Insure that the latch locks are free from obstructions.



PR.399

Figure 19-4.—Folding the LR-1 liferaft for the RSSK-1 and RSSK-1A.

16. Place the excess dropline out the center of the lower container.

Closing The Container

To close the container, proceed as follows:

1. Insure that the actuating lever is easily visible at the hole in the top of the actuator assembly.
2. If the lever is not visible, the actuator assembly must be reset. Insert a screwdriver in the manual release hole on the starboard side of the lower container and move the screwdriver aft. When the lever is properly positioned, the spring tension on the screwdriver will relax. Recheck the position through the top hole in the actuator assembly.
3. Place the upper container on top of the lower container.
4. Engage the hinges on the front of the container.
5. While closing the container, check the extruded metal lip for obstruction.
6. When the container is closed, insert the KIT RELEASE handle into the actuator assembly and seat it. Insure that the handle is fully seated and locked. Check the three latch inspection holes to insure proper position on the RSSK-1A.
7. Examine the extruded metal lip around the container. All latches must be engaged and the seam undistorted. If the containers are not properly secured, release the handle and repeat the closing steps 2 through 7.
8. Insure that the inspection hole plug is in place
9. Attach the cushion to the top of the upper container.

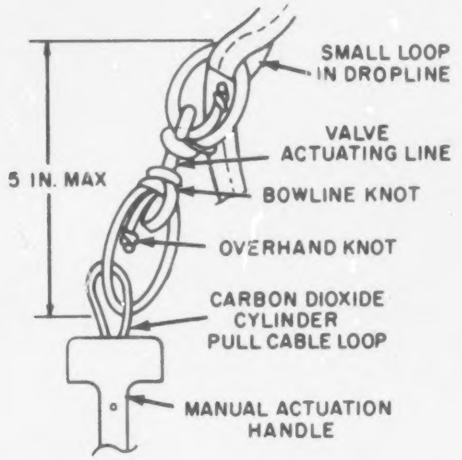


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Figure 19-5.–Actuating line attachment to the dropline.

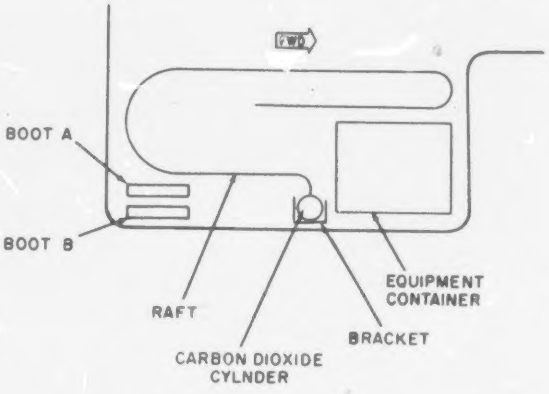

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Figure 19-6.–Folding the liferaft and boots into the container.

10. Attach the retaining straps and make the tacking with nylon 6-cord, type I, class 2, single. Insure that proper reeving of the straps is performed. Pull the strap through the fitting until the main portion of the belt assembly rests approximately 1 inch from the top of the fitting.

11. Secure the upper and lower blocks to the survival kit.

12. The RSSK-1A when used in the MK-H7 ejection seat, should be weighed. The total weight must be between 40 and 49 pounds. If it is underweight, the kit must be ballasted by placing lead shot in a durable heat sealed plastic bag, and positioning the shot bag in the center of the lower container in or under the equipment container.

13. Charge the oxygen system in accordance with the information detailed in NavAir 13-1-6.3.

14. Perform the release handle pull test.

15. Fill out and initial the survival kit History Card and obtain the CDI signature.

NOTE: The Inspection Check Off Form with the RSSK should be returned to the organizational activity maintaining custody of the item.

INSPECTION AND MAINTENANCE

The daily inspection is performed on all in-service survival kit assemblies. This inspection is performed in accordance with local maintenance requirement cards by the organizational maintenance activity, plane captain, or a delegated aircrewman. The inspection is performed daily and following ground transportation of an RSSK. The Daily Inspection involves only in-place checks of the following:

1. Release handle for proper seating and corrosion.
2. Cushion for security of attachment, rips, tears, and loose or frayed stitching.
3. Oxygen gage for a FULL indication.
4. Lower block lanyard for security of attachment to the aircraft structure and broken strands in the cable.
5. Manual oxygen release for security of attachment (if separating type) and deterioration.
6. Container assembly for cracks, breaks and other obvious damage.
7. Harness assembly for loose or frayed webbing and stitching, and security of attachment.
8. Upper block for security of attachment to the intermediate block, corrosion, and the security of all hoses and connections.
9. Lower block for security of attachment to the intermediate block, corrosion and security of hoses.
10. Beacon actuator indicator for bent shaft, cotter pin for pin elongation and corrosion.

Maintenance

AUTOMATIC BEACON ACTUATION.–If the beacon has been rigged for manual actuation and automatic actuation is desired, perform the following:

1. Remove the cotter pin from the actuator indicator (keeping the plunger depressed), insert the cotter pin through the loop of the actuator lanyard, and reinstall the cotter pin.
2. Raise the rear of the survival kit to gain access and pass the actuation lanyard through the opening in the aft corner of the seat bucket.
3. Connect the snaphook of the actuation lanyard to the lower block cable above the unlocking ring of the lower block.

If any damage or discrepancy is found that cannot be corrected by the organizational level of maintenance, the survival kit assembly must be replaced.

An Original Issue inspection is performed on all survival kits when placed into service. A Calendar inspection is performed to coincide with the aircraft calendar inspection. The Special inspection is performed at a time other than the aircraft calendar inspection interval. These inspections consist of a visual check for general conditions and a functional check of the survival kit.

The visual inspection is performed prior to the functional check of the survival kit.

The functional check is performed at each calendar check to determine the condition of the kit, and after adjustment or maintenance of the kit.

For more detailed information concerning RSSK check and test procedures, troubleshooting, modifications, source and recoverability codes refer to the Survival Kits And Items Manual, NavAir 13-1-6.3.

RSSK-2

The rigid seat survival kit-2 (RSSK-2) is designed for use with the North American HS-1 ejection seats. It functions as a seat for the aircrewman and a container to house the emergency oxygen supply, liferaft, and survival items. (See fig. 19-7.)

CONFIGURATION

The RSSK-2 is constructed of a bonded fiberglass body and an extruded metal lip interconnecting the upper and lower containers. The kit is opened by the yellow KIT RELEASE handle mounted on the aft right side. The handle incorporates a concealed knife (knife extended) in the forward bottom edge which is actuated by a knob located on the handle.

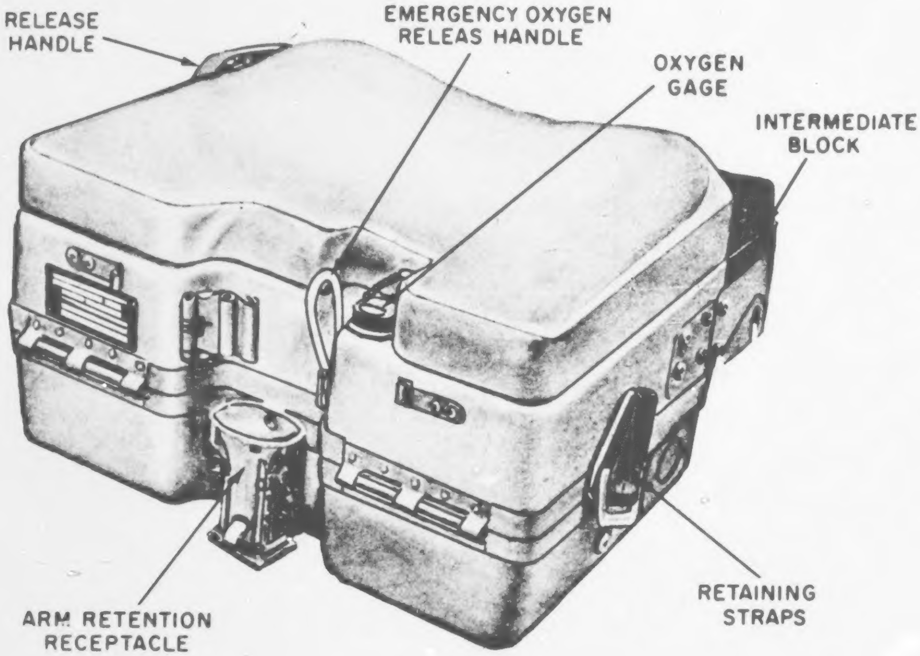
Two metal loops on each side of the container, and a slide fastener on the back of the container, provide attachment of the kit to the aircrewman's parachute assembly. Upper and lower quick disconnect blocks, interconnected by an intermediate block permanently mounted on the aft left side of the upper container, provides the connection for communications, suit ventilation, oxygen, and anti-g functions between the aircraft and aircrewman. In the event of a failure of the aircraft oxygen system, emergency oxygen is available by pulling the manual oxygen release on the kit. Oxygen from the kit flows to the aircrewman through the emergency oxygen system reducer/manifold in the kit. A check valve in the intermediate block prevents the emergency oxygen from flowing out of the bottom of the intermediate block when the lower block has been separated. It also prevents the ship's oxygen from flowing overboard if the upper block is separated and the aircraft's oxygen ON-OFF valve is ON. The reducer/manifold is automatically operated by separation of the lower quick disconnect block from the intermediate block during ejection.

The upper container houses the emergency oxygen supply; the lower container houses the liferaft and survival equipment and the arm retention system receptacle is secured to the front of the container.

When seated aboard the aircraft, the aircrewman connects the quick release fittings on the retaining straps to his torso harness suit. The personal service leads are connected via the quick disconnect upper block. These leads can be quickly disconnected by pulling the leads one at a time or by removing the upper block.

Major subassemblies of the RSSK-2 are as follows:

1. Emergency oxygen system.
2. Upper and lower containers.


RELEASE HANDLE
EMERGENCY OXYGEN RELEAS HANDLE
OXYGEN GAGE
INTERMEDIATE BLOCK
ARM RETENTION RECEPTACLE
RETAINING STRAPS

PR.402

Figure 19-7.–RSSK-2 assembly.

3. Upper, lower, and intermediate blocks.
4. Release mechanism.
5. Dropline.

The RSSK-2 is a part of the survival equipment used by personnel aboard the RA-5C aircraft.

When the aircrewman ejects from the aircraft, the following functions occur:

1. The lower block is separated from the kit at the intermediate block. As the block separates, the reducer/manifold is activated and the aircrewman is provided oxygen for descent.

NOTE: If automatic actuation of the emergency oxygen fails, emergency oxygen may be obtained by pulling the manual oxygen release.

2. When deployment is desired, the aircrewman pulls the yellow release handle. The lower container falls away but remains attached to the upper container by the dropline. The liferaft, attached to the dropline, is automatically inflated.

RIGGING AND PACKING

The rigging and packing procedures for the RSSK-2 are accomplished in five operations:

1. Preliminary procedures.
2. Stowing survival items.
3. Folding, rigging, and packing of the liferaft.
4. Stowing the dropline.
5. Closing the container.

Preliminary Procedures

1. Insure that the RSSK-2 and components to be replaced are inspected.
2. Position the kit so that the upper and lower containers are properly alined.
3. Insure that the dropline is attached to the upper container.
4. Insure that the liferaft has been inspected.
5. Check the interior of the kit for corrosion of the cables and fittings, crushed conduits, loose terminals and fittings.

Stowing The Survival Items

With approximately 10 feet of nylon cord, type I, tie all of the survival items together. Place the survival items into the equipment container and close the slide fastener, tie the free end of the nylon cord from the survival items to the slide fastener. Place the equipment container in the forward part of the lower container with the slide fastener facing aft.

Folding, Rigging, And Packing Of The LR-1 Liferaft

To fold, rig, and pack the liferaft, proceed as follows:

1. If the valve actuating line is damaged, incorrectly installed or not installed, install a new line in accordance with steps 2 and 3.
2. Cut a 15-inch length of 550-pound nylon cord, type III, and sear the ends.
4. Route one end of the actuating line through the small loop on the dropline and tie the line with a bowline knot. Tack the knot with three turns of waxed, size E nylon thread, single. Tie the ends with a surgeon's knot followed by a square knot. (See fig. 19-3.)
4. Position the upper container on the opposite side from the release handle of the lower container. Fake the retaining line attached to the neck of the carbon dioxide cylinder and stow line in the raft retaining line pocket. Close the pocket closure tab and mate the hook and pile tape patches.
5. Fold the raft as shown in figure 19-8.
6. The maximum width of the folded raft should not exceed the width of the cover. Adjust the folds as necessary.
7. Place the raft forward of the lower container with the carbon dioxide cylinder positioned toward the container and the valve assembly facing the release handle.
8. Unscrew the valve from the raft. Do not remove the cylinder from the pocket or the anti-chafing disk from the inlet check valve.
9. Attach the large loops around the neck of the valve at the cylinder end with a double cord hitch knot. Pull the knot tight. Tack the knot with two turns of waxed nylon 6-cord, single. Tie the ends with a surgeon's knot followed by a square knot.
10. Reattach the valve to the raft and tighten.
11. Pass the actuating line through the small loop in the end of the pull cable. Tie a loop using a bowline knot. Tack the knot with three turns of waxed, size E nylon thread, single. Tie the end with a surgeon's knot followed by an overhand knot. The final dimension of the valve actuating line is critical; the finished length must not exceed 5 inches.
12. Insert the folded raft into the lower container. (See fig. 19-9.)
13. Place the raft cover over the raft and tuck it in completely around the raft. The raft material must not protrude beyond the cover and the cover must not extend beyond the edges of the container.

Stowing The Dropline

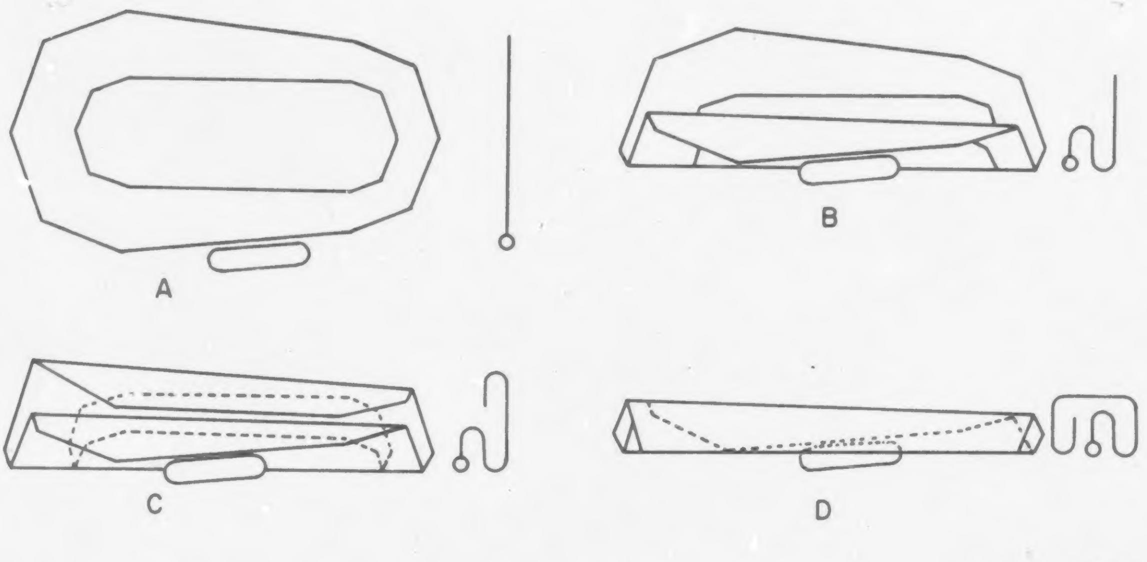
To stow the dropline, proceed as follows:

1. Secure the free end of the dropline to the equipment container handle with a bowline knot.
2. Accordion fold approximately 10 feet of the dropline in the bottom of the container between the equipment container and the raft.
3. Accordion fold approximately 12 feet of the dropline along the left side of the liferaft.
4. Accordion fold the remainder of the dropline between the liferaft and the equipment container.

Closing The Container

To close the container, proceed as follows:

1. Place the upper container on top of the lower container and engage the hinges on front of the containers.



PR.403

Figure 19-8.—Folding the RSSK-2 LR-1 liferaft.

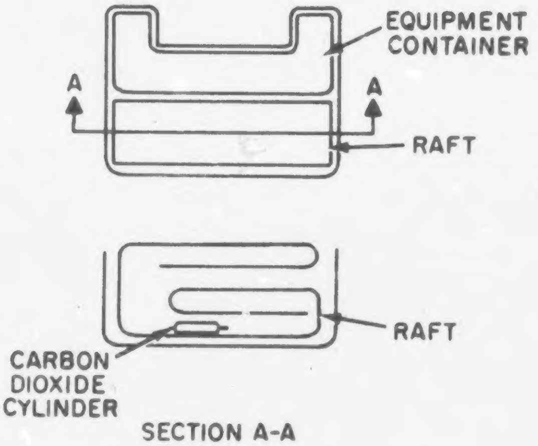


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Figure 19-9.—Inserting the liferaft into the lower container.

2. While closing the container, check for obstructions.

3. When the container is closed, insert the handle in the release assembly and lock it.

4. Charge the oxygen system to 1800 psi.

5. Perform the release handle pull test. The force required should be 10 to 20 pounds.

INSPECTION AND MAINTENANCE

The Daily Inspection and Maintenance requirements for the RSSK-2 closely parallel those procedures discussed earlier in this chapter for the RSSK-1 and 1A. Therefore, those applicable procedures will not be repeated here.

The Visual Inspection must be performed prior to the functional check of the kit. Visually check the kit for the following:

1. Release handle for wear, corrosion, and damage.

2. Upper block for corrosion, damaged threads, cracked parts, and worn or damaged O-rings.

3. Intermediate block for corrosion, cracks, and bent or broken pins in the electrical connector.

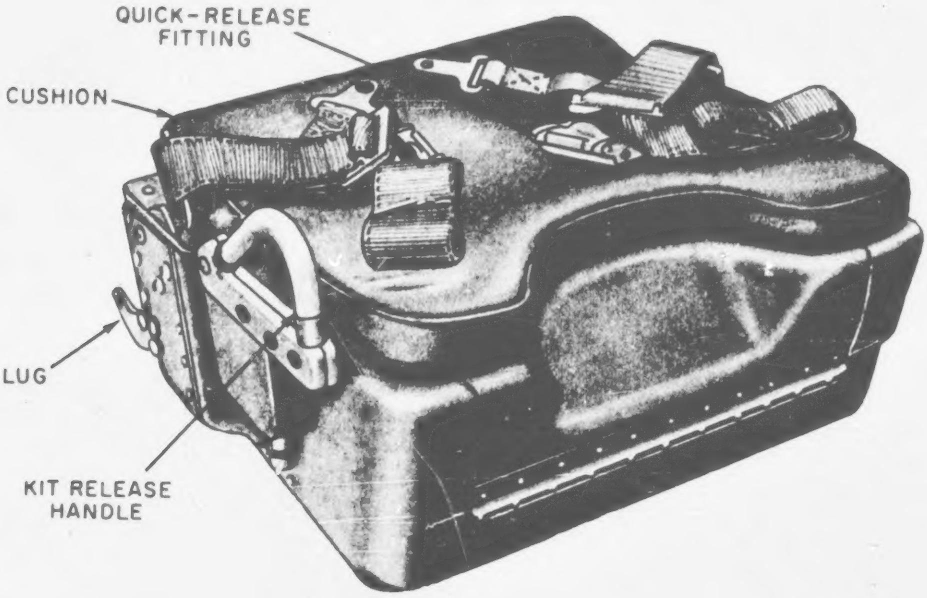

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Figure 19-10.—RSSK-5 assembly.

4. Lower block for corrosion, cracks, and the lanyard for security and frayed or broken strands.
5. Upper and lower containers for cracks, corrosion, and security of the hardware.
6. Webbing for loose or frayed stitching, security of attachment, and the release fitting for satisfactory operation.
7. Parachute attachment slide fastener for ease of operation and for corrosion.
8. Valid hydrostatic test date for the oxygen cylinder (within 5 years).

For additional detailed information concerning the RSSK-2 check and test procedures, troubleshooting guide, modifications, and maintenance requirements refer to NavAir 13-1-6.3.

RSSK-5

The rigid seat survival kit-5 (RSSK-5) is designed for use with the Martin-Baker MK-A5A, MK-L5A, MK-M5A, MK-N5A, and MK-Z5A ejection seats and functions as a seat for the aircrewman, as well as a container for a liferaft and survival items. (See fig. 19-10.)

CONFIGURATION

The RSSK-5 is constructed of a fiberglass body with an extruded metal lip interconnecting the lid and lower container. The kit is opened by the yellow kit release handle mounted on the right forward side. Two adjustable retaining straps, connected to the lower container, are provided for attachment to the aircrewman's torso harness suit. The kit consists of a lid and lower container, which houses the liferaft and survival items. Basic survival items packed in the RSSK-5 are listed in chapter 15 of this manual.

When seated aboard the aircraft, the aircrewman connects the quick release fittings on the kit retaining straps to his torso harness suit. After ejection and seat separation, the following functions occur:

1. When deployment is desired, the aircrewman pulls the yellow release handle.
2. The lower container falls away, but remains attached to the retention straps by the dropline. The liferaft, attached to the dropline, is automatically inflated.

The RSSK-5 is part of the survival equipment used by aircrewmen aboard the F-3B, AF-9J, and T-1A aircraft.

RIGGING AND PACKING

Prior to rigging and packing the RSSK-5, the assembly should be updated by comparing the configuration of the assembly with the modifications listed in NavAir 13-1-6.3.

The rigging and packing procedures for the RSSK-5 are accomplished in 5 operations:

1. Preliminary procedures.
2. Stowing the dropline.
3. Stowing the survival items.
4. Folding, rigging, and packing the liferaft.
5. Closing the container.

Preliminary Procedures

To perform the preliminary procedures, proceed as follows:

1. Insure that the RSSK and the components to be repacked have been inspected.
2. Position the RSSK-5 lid and cover on the table.
3. Inspect the dropline for proper attachment to the lower container. Insure that the equipment container lanyard is securely attached. The dropline length must be 28 feet, 1 inch, plus or minus 2 feet.
4. Insure that the liferaft has been inspected. Check the interior of the kit for security of the dropline, cables, and fittings for corrosion, crushed conduits, and loose terminal fittings.

Stowing The Dropline

To stow the dropline into the boots, proceed as follows:

1. Form a bight 5 inches from the base of the small loop stitching. The bight should be in the portion of the dropline going to the upper container. With boot B positioned behind the lower container, stow the bight in channel number 1.

Push the bight into the channel with a 7-inch length of 3/8-inch hardwood dowel with rounded and smoothed ends. There should be a 1/2-inch protrusion at the end of the channel.

2. The second bight is formed in the portion of the dropline going from the small loop to the large loop and it should be stowed in channel number 2. All line to the small loop should be stowed.
3. Place a half-twist in the dropline so that the large loop faces up. Stow the third bight in channel number 3. All line to the large loop should be stowed.
4. Stow the remainder of the dropline in the boot in accordance with the numbering sequence on the boots as shown in figure 19-2, maintaining the 1/2-inch protrusion. Final dropline bights should exit the boots as shown in figure 19-2.
5. Form bight number 11 in the dropline 15 to 17 inches from the bottom of the last bight in boot B. Stow the bight in channel number 11. There should be 6 to 8 inches of dropline between boots A and B when bight number 11 is stowed.
6. Continue stowing bights in boot B until all of the line is stowed. Maintain the 1/2-inch protrusion. Do not twist the lines when making the stows.
7. Remove all twists from the dropline as necessary.

Stowing The Survival Items

To stow the survival items, proceed as follows:

1. Using approximately 10 feet of nylon cord, type I, tie all of the survival items together.
2. Install the survival items in the equipment container and close the slide fastener, tie the free end of the nylon cord used on the survival items to the slide fastener.
3. Place the equipment container in the rear part of the lower container with the slide fastener facing the rear of the container.
4. Tie one end of a 30 inch length of nylon cord, type III, to the nylon loop attached to the equipment container. Tie the free end of the nylon cord above the inverted "V" of the dropline. Use a bowline knot for both ties.
5. Insert the boots into the lower container.

Folding, Rigging, And Packing The LR-1 Liferaft

To fold, rig, and pack the LR-1 liferaft, proceed as follows:

1. If the valve actuating line is damaged, incorrectly installed or not installed, install a new line as discussed in steps 2 and 3.
2. Cut a 15-inch length of 550-pound nylon cord, type III, and sear the ends.
3. Route one end of the line through the small loop on the dropline and tie it off using a bowline knot. Tack the knot with three turns of waxed, size E nylon thread, single. Tie the ends with a surgeon's knot followed by a square knot.
4. Position the lid on the opposite side of the release handle of the lower container. Place the boots forward in the lower container.

Fake the retaining line attached to the carbon dioxide cylinder and stow it in the raft retaining line pocket. Close the pocket closure tab and mate the hook and pile tape patches.

5. Fold the raft as shown in figure 19-4.
6. The maximum width of the folded raft must not exceed the width of the cover. If necessary, adjust the folds.
7. Place the raft forward of the lower container with the carbon dioxide cylinder positioned toward the container and the valve assembly on the side opposite the release handle.
8. Remove bight number 3 with the loops from the boot.
9. Unscrew the valve from the raft. Do not remove the cylinder from the pocket or the antichafing disk from the inlet check valve.
10. Attach the large loops around the neck of the valve at the cylinder end with a double cord hitch knot. Pull the knot tight. Tack the knot with two turns of waxed nylon 6-cord, single. Tie off the ends with a surgeon's knot followed by a square knot.
11. Reattach the valve to the raft and insure that it is tightened.
12. Pass the actuating line through the small loop in the end of the pull cable. Tie a loop using a bowline knot. Tack the knot with three turns of waxed, size E nylon thread, single. Tie the ends with a surgeon's knot. The finished length of the actuating line should not exceed 5 inches.

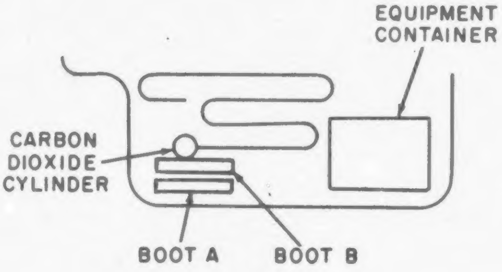

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Figure 19-11.—Accordion folding the raft into the container.

13. Restow the bight removed in step 8. The bight should not extend the full length of the channel.
14. Accordion fold the raft into the container. (See fig. 19-11.)
15. Place the raft cover over the raft and tuck it in completely around the raft.
16. Route the excess dropline out the forward end of the container.

Closing The Container

To close the container, proceed as follows:

1. Place the lid on top of the lower container and route the dropline through the slot in the left rear corner with the retaining ring left inside the kit.
2. While closing the container, check the metal seal and each latch for obstructions.
3. When the container is closed, insert the yellow release handle into the actuator assembly. Insure that the handle is fully seated and locked. Check the latch inspection holes to insure proper positioning.
4. Check the extruded metal lip on the front of the container. All latches must be engaged and the seal undistorted.
5. Attach the cushion to the top of the lid.
6. Insert both harness assemblies into their respective positions with the sticker clips toward the rear of the kit.

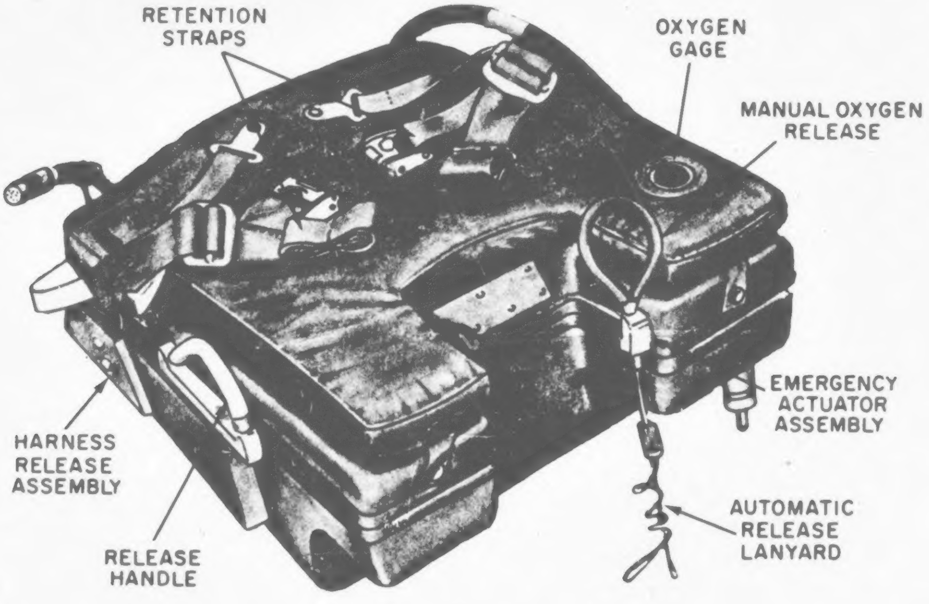

Figure 19-12.–RSSK-6 assembly.

7. Perform the release handle pull test.
8. Fill out and initial the survival kit history card.

INSPECTION AND MAINTENANCE

The inspection and maintenance procedures for the RSSK-5 parallel the procedures discussed earlier in this chapter for other rigid seat survival kits. For more detailed information concerning the RSSK-5, refer to NavAir 13-1-6.3.

RSSK-6

The RSSK-6 is designed for use with the Martin-Baker MK-F5A ejection seats; the RSSK-6B, -6B2 are for use in the MK-F7A ejection seats and each functions as a seat for the aircrewman as well as a container for an emergency oxygen system, liferaft, and survival items. The RSSK-6 is shown in figure 19-12.

CONFIGURATION

The RSSK-6 is constructed of a bonded fiberglass body and extruded metal lip interconnecting the upper and lower containers. The kit is opened by the yellow kit release handle mounted on the right side.

Two adjustable retaining straps, attached to the upper and lower containers, provide for attachment of the kit to the aircrewman's torso harness suit. In the event of a failure of the aircraft oxygen system, emergency oxygen is available by pulling the manual oxygen release on the kit. Oxygen from the kit then flows to the aircrewman through the emergency oxygen reducer in the kit. A check valve in the manifold prevents emergency oxygen from flowing into the aircraft system or overboard from the kit.

The reducer is automatically activated at ejection by a cable attached to the cockpit deck. The upper container houses the emergency oxygen supply; the lower container houses the liferaft and survival equipment.

When seated aboard the aircraft, the aircrewman connects the kit quick release fittings on the retaining straps to his torso suit. The oxygen hose is connected to the cockpit console. These leads may be quickly disconnected by pulling the leads at the disconnect points.

The RSSK-6 is a part of the survival equipment used by aircrewmen aboard the F-8 series aircraft.

When the aircrewman ejects from the aircraft, the emergency oxygen is automatically supplied to him when the emergency oxygen reducer, connected by a lanyard to the cockpit structure, is actuated by upward movement of the seat. All hose connections are broken at the cockpit console.

If automatic actuation of the emergency oxygen fails, emergency oxygen may be obtained by pulling the manual oxygen release.

When deployment is desired, the aircrewman pulls the yellow release handle. The lower container falls away but remains attached to the upper container by the dropline. The liferaft, attached to the dropline, is automatically inflated.

RIGGING AND PACKING

Rigging and packing procedures for the RSSK-6 are accomplished in five operations:

1. Preliminary procedures.
2. Stowing the dropline.
3. Stowing the survival items.
4. Folding, rigging, and packing the LR-1 liferaft.
5. Closing the container.

Preliminary Procedures

To perform the preliminary procedures, proceed as follows:

1. Insure that the RSSK-6 and the components to be repacked have been inspected.
2. Position the RSSK-6 on the table so that the inside of the upper and lower containers face up.
3. Insure that the dropline is attached to the upper and lower container. Insure that the equipment container lanyards are attached. The dropline length must be 28 feet 1 inch, plus or minus 2 feet.
4. Insure that the liferaft has been inspected.
5. Insure that the battery and beacon have been tested.
6. Check the interior of the kit for security of the dropline, cables, and fittings for corrosion, crushed conduits, loose terminal fittings, and security of the beacon bracket.

Stowing The Dropline

The numbers on the stowage channels of the boots correspond to the dropline bights and the order in which they are stowed. (See fig. 19-2.) The numbers appear in the illustration for clarity; they do not actually appear on the stowage boots.

To stow the dropline into the boots, proceed as follows:

1. Form a bight 5 inches from the base of the small loop stitching. The bight should be in the portion of the dropline going to the upper container. With boot B positioned as shown in figure 19-2 (behind the lower container), stow the bight in channel number 1. Push the bight into the channel so that there will be a 1/2-inch protrusion at the end of the channel.
2. The second bight is formed in the portion of the dropline going from the small loop to the large loop and is stowed in channel number 2. All line to the small loop should now be stowed.
3. Place a half twist in the dropline so that the large loop faces up. Stow the third bight in channel number 3. All line to the large loop should now be stowed.
4. Stow the remainder of the dropline in the boot in accordance with the numbering sequence on the boots, maintaining the 1/2-inch protrusion. The final dropline bights should exit the boots as shown in figure 19-2.
5. Form bight number 11 in the dropline 15 to 17 inches from the bottom of the last bight in boot B. Stow the bight in channel number 11. There should be 6 to 8 inches of dropline between boots A and B when bight number 11 is stowed.
6. Continue stowing the bights in boot B until all of the line is stowed. Maintain the 1/2-inch protrusion. Do not twist the lines when stowing.
7. Remove all twists in the dropline stows as necessary.

Stowing The Survival Items

To stow the survival items, proceed as follows:

1. Using approximately 10 feet of nylon cord, type I, tie all of the survival items together.

2. Remove the automatic activation plug and remove and discard the retrieval and automatic activation lanyard from the beacon.

3. Remove the threaded metal insert from the beacon with a T-wrench.

NOTE: Step 4 applies only when automatic actuation of the beacon is desired.

4. Remove the cotter pin from the actuator indicator, attach a loop of the actuation lanyard to the cotter pin, and reinstall the cotter pin to the actuator indicator. For connection of the other end of the lanyard, connect the snaphook of the actuation lanyard to the "D" ring provided on the cockpit deck.

5. Connect the flexible wire antenna to the beacon.

NOTE: Speed in compliance with steps 6 and 7 is important as the beacon will be on and transmitting.

6. Turn the beacon switch ON, install the beacon into the bracket and secure it with the hook and pile tape.

7. Insert the actuator indicator through the hole in the container and screw it into the beacon. This action prevents transmitting.

8. Route the antenna.

9. Install the survival items in the equipment container, close the slide fastener, and tie the free end of the nylon cord from the survival items to the slide fastener.

10. Place the equipment container in the rear part of the lower kit container with the slide fastener facing the rear of the container. Route the beacon antenna.

11. Reeve the hold down straps tightly across the top of the equipment container. Stow the excess straps into the voids. Do not knot or tack the hold down straps.

12. Tie one end of a 30 inch nylon cord, type III, to the nylon loop attached to the equipment container. Tie the free end of the cord above the inverted "V" of the dropline. Use a bowline knot for both ends.

13. Insert the boots into the lower container.

Folding, Rigging, And Packing The LR-1 Liferaft

To fold, rig and pack the LR-1 liferaft, proceed as follows:

1. If the valve actuating line is damaged, incorrectly installed or not installed, install a new line.

2. Cut a 15 inch length of 550-pound nylon cord, type III and sear the ends.

3. Route one end of the cord through the small loop on the dropline and tie it off with a bowline knot. Tack the knot with 3 turns of waxed, size E nylon thread, single. Tie the ends with a surgeon's knot followed by a square knot.

4. Position the upper container on the side opposite the handle of the lower container. Place the boots forward of the lower container. Fake the remaining line attached to the neck of the carbon dioxide cylinder and stow it in the raft retaining line pocket. Close the pocket closure tab and mate the hook and pile tape patches.

5. Fold the raft as shown in figure 19-4.

6. The maximum width of the folded raft must not exceed the width of the cover. Adjust the folds as necessary.

7. Place the raft forward of the lower container with the carbon dioxide cylinder positioned toward the container and valve assembly at the left side of the container.

8. Remove bight number 3 from the boot with the loops.

9. Unscrew the valve from the raft. Do not remove the cylinder from its pocket or the antichafing disk from the inlet check valve.

10. Attach the large loops around the neck of the valve at the cylinder end with a double cord hitch knot. Pull the knot tight. Tack the knot with two turns of waxed nylon 6-cord, single. Tie the ends with a surgeon's knot followed by a square knot.

11. Attach the valve to the raft and tighten it securely.

12. Pass the actuating line through the small loop in the end of the pull cable. Tie a loop using a bowline knot. Tack the knot with three turns of waxed, size E nylon thread, single. Tie the ends with a surgeon's knot followed by a square knot. The finished length of the valve actuating line must not exceed five inches.

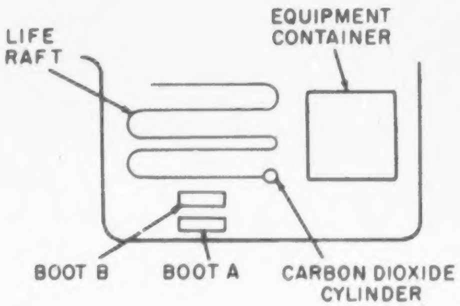

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Figure 19-13.—Positioning the raft in the lower container.

13. Restow the bight removed in step 8. The bight should not extend the full length of the channel.
14. Hold the raft firmly in the bottom of the container with the carbon dioxide cylinder and boot positioned over the brackets. Accordion fold the raft into the container, positioning the folds away from the rear wall. (See fig. 19-13.)
15. Place the raft cover over the raft and tuck it in completely around the raft. No raft material should protrude beyond the cover and the cover should not extend beyond the edges of the container.

Closing The Container

Procedures for closing the container are as follows:

1. Place the lid on top of the lower container and route the dropline through the slot in the right rear corner of the kit with the retaining ring stowed inside the container.
2. Engage the hinges on the front of the container.
3. While closing the container, check the extruded metal lip and each latch for obstructions.
4. When the container is closed, insert the yellow release handle into the actuator assembly and seal. Insure that the handle is fully seated and locked. Check the latch inspection holes to insure proper positioning.
5. Inspect the extruded metal lip around the container. All of the latches must be engaged and the seam undistorted. If the containers are not properly secured, release the handle and repeat this step.
6. Insure that the inspection hole plug is in place.
7. Attach the cushion to the top of the upper container.
8. Insert the harness assemblies into their respective positions.
9. Perform the release handle pull test. The force required to unlock the release handle from the kit should be 10 to 30 pounds and the locks must release in sequence; otherwise, the upper and lower container may fail to separate.
10. Charge the oxygen system to 1,800 psi.
11. Fill out and initial the Survival Kit History Card and obtain the CDI signature.

INSPECTION AND MAINTENANCE

The inspection and maintenance procedures for the RSSK-6 are generally those procedures that apply to other RSSK's. Configuration difference may result in some inspection and maintenance procedural deviation. Therefore, in each case reference should be made to NavAir 13-1-6.3.

RSSK-8A

The RSSK-8A is designed for use with the Douglas ESCAPAC ejection seat and functions as a seat for the aircrewman as well as a container for an emergency oxygen system, liferaft, and survival equipment. (See fig. 19-14.) Two kits are available from separate manufacturers. One is manufactured by Rocket Jet Engineering Corp. and the other by Scott Aviation Corp.

CONFIGURATION

The RSSK-8A is constructed of a bonded fiberglass body and an extruded metal lip interconnecting the upper and lower containers. The kit is opened by the yellow handle mounted on the forward right side. Two adjustable retaining

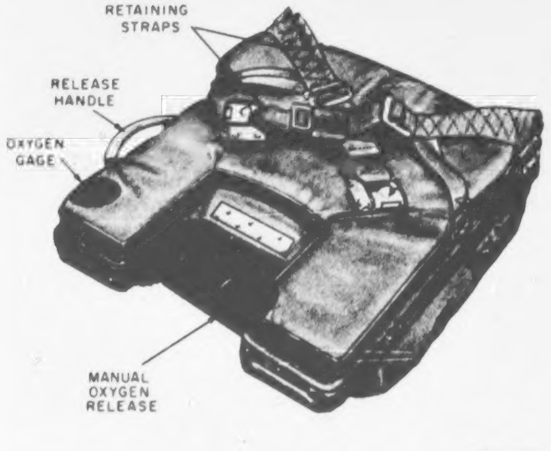


Figure 19-14.–RSSK-8A assembly.

straps, permanently mounted on the upper container, provide for the attachment of the kit to the aircrewman's torso harness suit.

A flexible oxygen and communication hose installed on the aft left side of the upper container provides connection for communications and oxygen functions between the aircraft and aircrewman. In the event of a failure of the aircraft oxygen system, emergency oxygen is available by pulling the manual oxygen release on the kit.

Oxygen from the kit then flows to the aircrewman through the emergency oxygen system reducer in the kit. A check valve in the oxygen line prevents emergency oxygen from flowing into the aircraft system or overboard from the kit. The reducer is automatically operated by a lanyard connected between the actuator and aircraft structure during ejection.

The upper container houses the emergency oxygen supply; the lower container, the liferaft and survival equipment.

When seated aboard the aircraft, the aircrewman connects the kit quick release fittings on his retaining straps to his torso harness suit. The personal service leads are connected via the quick disconnect fittings.

These leads can be quickly disconnected by pulling the leads at the disconnect points.

NavAir 13-1-6.3 contains information on each assembly, subassembly, and component part for each RSSK-8A. The figure and index number, reference or part number, description, and units per assembly are provided. In general, parts are not interchangeable between different manufacturers. Make sure the proper breakdowns are used when servicing a kit or ordering replacement components.

The RSSK-8A is a part of the survival equipment used by aircrewmen aboard A-4F, A-7A, TA-4F, and A-4H aircraft.

When the aircrewman ejects from the aircraft, the lanyard to the oxygen reducer is actuated by seat ejection and the aircrewman is provided with oxygen for the parachute descent. When deployment is desired, the aircrewman pulls the release handle. The lower container falls away but remains attached to the upper container by the dropline. The liferaft, attached to the dropline, is automatically inflated.

RIGGING AND PACKING

Rigging and packing procedures for the RSSK-8A are accomplished in five operations as follows:

1. Preliminary procedures.
2. Stowing the dropline.
3. Stowing the survival items.
4. Folding, rigging, and packing the liferaft.
5. Closing the container.

Preliminary Procedures

The preliminary procedures for the RSSK-8A are the same procedures that were discussed earlier for the RSSK-6, except for the following:

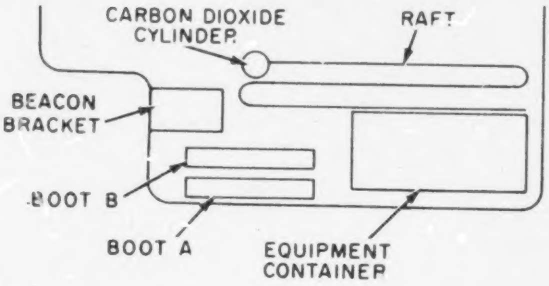
1. The dropline length for the RSSK-8A must be 26 feet, 4 inches, plus or minus 2 feet.

Stowing The Dropline

The procedures for stowing the dropline in the RSSK-8A are the same as those procedures discussed earlier in this chapter for the RSSK-6.

Stowing The Survival Items

The procedures for stowing the survival items in the RSSK-8A are the same as those procedures discussed for the RSSK-6.



PR.410

Figure 19-15.—Folding the liferaft into the RSSK-8A container.

Folding, Rigging, And Packing The LR-1 Liferaft

The folding, rigging, and packing procedures for the RSSK-8A are the same as those procedures discussed earlier for the RSSK-6, with the following exceptions:

Step 4. Position the upper and lower containers side by side, with the upper on the side opposite the release handle of the lower. Place the boots aft of the lower container. Fake the retaining line attached to the neck of the carbon dioxide cylinder and stow the line in the raft retaining line pocket. Close the pocket closure tab and mate the hook and pile tape patches.

Step 5. Fold the raft as shown in figure 19-4.

Step 7. Place the raft behind the lower container with the carbon dioxide cylinder on the raft end closest to the container and valve assembly facing the release handle.

15. Place the raft into the forward end of the container and fold it as shown in figure 19-15.
17. Place the raft cover on the raft and tuck it in securely around the raft. Insure that the latch locks are free from obstructions.
18. Route the excess dropline out the center of the container.

Closing The Container

To close the container, proceed as follows:

1. Place the upper container on top of the lower container.
2. Engage the hinges on the front of the container.
3. While closing the container, lead the emergency oxygen actuating lanyard through the hole in the right side of the left thigh support.
4. Insure that the lock engagement is made by checking the slots on the lower container.
5. When the container is closed, insert the handle into the actuator assembly. Insure that the handle is fully seated and locked.
6. Inspect the extruded metal lip around the container. All of the latches must be engaged and the seam undistorted.
7. Insure that the inspection hole plug is in place.
8. Attach the cushion to the upper container.
9. Charge the emergency oxygen system to 1,800 psi.
10. Perform the release handle pull test.
11. Fill out and initial the Survival Kit History Card and obtain the CDI signature.

INSPECTION AND MAINTENANCE

The inspection interval and requirements for the RSSK-8A are the same as those requirements discussed earlier in this chapter concerning all in-service survival kit assemblies. Reference should be made to NavAir 13-1-6.3 concerning procedures relating to the Functional Check and maintenance on the various RSSK configurations.

RSSK-9

The Rigid Seat Survival Kit-9 is designed for use with the LW-3B escape system and functions as a seat for the aircrewman as well as a container for the liferaft and survival items. The RSSK-9 is shown in figure 19-16.

Two kits are available from separate manufacturers. One is manufactured by Rocket Jet Engineering Corp. and the other by Scott Aviation Corp. In general, parts are not interchangeable between different manufacturers. Insure that the proper breakdowns are used when servicing a kit or ordering replacement components.

CONFIGURATION

The RSSK-9 is constructed of a bonded fiberglass body with an extruded metal lip

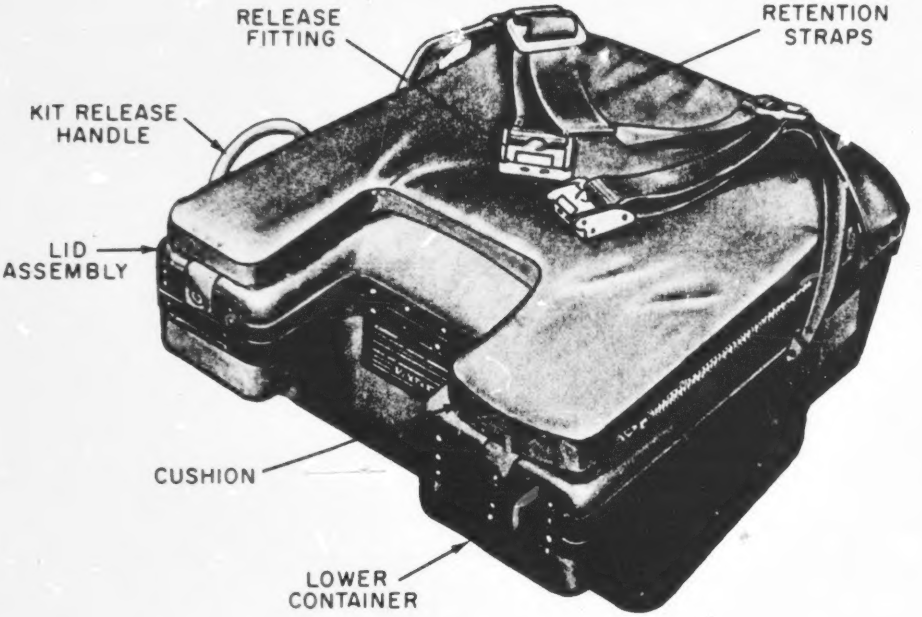


Figure 19-16.–RSSK-9 assembly.

interconnecting the lid and lower container. The kit is opened by the yellow kit release handle mounted on the right forward side.

Two adjustable retaining straps, permanently mounted on the lid, provide the attachment to the aircrewman's torso harness suit. The kit consists of a lid and lower container, which houses the liferaft and survival items.

When seated aboard the aircraft, the aircrewman connects the quick release fittings on the kit retaining straps to his torso harness suit. The RSSK-9 is a part of the survival equipment used by aircrewmen aboard the OV-10A aircraft.

After ejection and seat separation when deployment is desired, the aircrewman pulls the yellow release handle. The lower container falls away, but remains attached to the lid by the dropline. The liferaft, attached to the dropline, is automatically inflated.

Prior to rigging and packing, the RSSK-9 must be updated by comparing the configuration of the assembly with the modifications listed in NavAir 13-1-6.3

RIGGING AND PACKING

Rigging and packing procedures for the RSSK-9 are accomplished in five operations:

1. Preliminary procedures.
2. Stowing the dropline.
3. Stowing the survival items.
4. Folding, rigging, and packing the LR-1.
5. Closing the container.

To perform the preliminary procedures, proceed as follows:

1. Insure that the RSSK-9 and components to be repacked have been inspected.
2. Position the lid and lower container on a table in the proper order.

3. Insure that the raft has been inspected in accordance with NavAir 13-1-6.1.

4. Inspect the dropline for proper attachment to the lid and lower container. The dropline length must be 26 feet, 4 inches, plus or minus 2 feet. Insure that the equipment container lanyards are securely attached.

5. Check the interior of the kit for security of the dropline, cables and fittings for corrosion, crushed conduits, and loose terminal fittings.

Stowing The Dropline

Procedures for stowing the dropline in the RSSK-9 are the same as those procedures discussed for the RSSK-6. (See fig. 19-2.)

Stowing The Survival Items

To stow the survival items, proceed as follows:

1. Using approximately 10 feet of nylon cord, type I, tie all of the survival items together.

NOTE: Steps 2, 3, and 4 are for the forward cockpit; additional information is available in NavAir 13-1-6.3.

2. Remove the existing screw on the deck area of the forward cockpit, starboard side.

3. Remove the D-ring and plate from the kit and enlarge the hole in the plate to a diameter sufficient to allow free passage of the screw removed in step 2.

4. Place the screw through the D-ring plate and reinstall the screw in the front cockpit.

NOTE: Steps 5, 6, and 7 are for the aft cockpit.

5. Remove the existing hexagon bolt on the deck plate of the aft cockpit, starboard side.

6. Enlarge the hole in the plate to a diameter sufficient to allow free passage of the bolt.

7. Place the bolt through the D-ring plate and reinstall the bolt in the aft cockpit.

8. Depress the red plunger protruding from the end of the indicator actuator (to reduce spring tension) and remove the hair cotter pin.

CAUTION: Do not release the pressure against the red plunger until the hair cotter pin has been reinserted.

9. While maintaining pressure on the plunger, insert the hair cotter pin attached to the appropriate (forward or aft) lanyard assembly through the coinciding holes of the actuator bushing and the red plunger.

10. Place the appropriate kit (forward or aft) in the aircraft ejection seat bucket; keep the front of the kit elevated and pass the snaphook through the opening in the starboard side of the bucket bottom.

11. Lower the RSSK-9 in the seat bucket and connect the snaphook to the D-ring on the aircraft deck.

12. Install the survival items into the equipment container, close the slide fastener and tie the free end of the nylon cord from the survival items to the slide fastener.

13. Place the equipment container in the aft part of the lower container with the slide fastener facing aft in the container. Route the beacon antenna.

14. Reeve the hold down straps tightly across the top of the equipment container. Stow any excess straps into the voids. Do not knot or tack the hold down straps.

15. Pass the equipment container lanyards around the equipment container hold down straps from the inside, and tie the lanyards to the webbing loops located on the aft corners of the equipment container with a bowline knot. Tack the end of the knot to the loop using two turns of waxed nylon 6-cord, single. Tie the ends of the tacking off with a surgeon's knot followed by a square knot.

16. Insert the boots into the lower container.

Folding, Rigging, And Packing The LR-1 Liferaft

To fold, rig, and pack the LR-1 liferaft, refer to those procedures discussed for the RSSK-6; the same procedures also apply for the RSSK-9 with the following exceptions:

4. Position the lid on the handle release side of the lower container. Place the boots forward of the lower container. Fake the retaining line attached to the neck of the carbon dioxide cylinder and stow the line in the retaining line pocket. Close the pocket closure tab and mate the hook and pile tape patches.

5. Fold the raft as shown in figure 19-4.

7. Place the raft behind the lower container with the carbon dioxide cylinder on the raft end

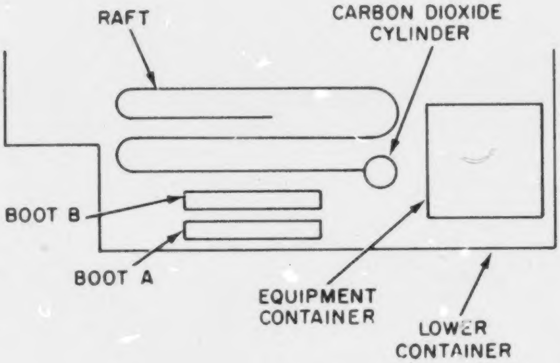


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Figure 19-17.—Folding the liferaft into the RSSK-9 container.

closest to the container and the valve assembly facing the release handle.

14. Hold the raft firmly in the forward part of the lower container, next to the equipment container. Accordion fold the raft into the container. (See fig. 19-17.)

16. Route the excess dropline out the lower container's forward wall.

Closing The Container

To close the container, proceed as follows:

1. Insure that the actuating lever is visible at the hole in the top of the actuator assembly.
2. If the lever is not visible, the actuator must be reset. Insert a screwdriver in the manual release hole on the starboard side of the lower container and move the screwdriver blade aft. When the lever is properly positioned, the spring tension on the screwdriver will relax. Recheck the lever position through the top hole in the actuator assembly.
3. Place the lid on top of the lower container.
4. Engage the hinges on the front of the container.
5. While closing the container, check the extruded metal lip and each latch for obstructions.
6. When the container is closed, insert the release handle into the actuator assembly and form the seal. Insure that the handle is fully seated and locked. Check the latch inspection holes to insure proper positioning.
7. Inspect the metal seam around the container. All latches should be engaged and the seam undistorted. If the containers are not properly secured, release the handle and reset.
8. Attach the cushion to the upper container and secure the snap fasteners.
9. Perform the release handle pull test.
10. Fill out and initial the Survival Kit History Card and obtain the CDI signature.

INSPECTION AND MAINTENANCE

The inspection and maintenance requirements for the RSSK-9 are essentially the same requirements performed on all other RSSK's. Refer to NavAir 13-1-6.3.

A functional check is performed at each calendar check to determine the condition of the kit, and also after any adjustment or maintenance of the kit. All maintenance work on the kit must be performed in a clean, dust and grease free area.

CHAPTER 20

NES-8B PERSONNEL PARACHUTE ASSEMBLY

The NES-8B parachute assembly includes a multicolored, 28-foot diameter, flat, circular nylon canopy with 28 gores and a pilot parachute. The canopy is packed in a hard-shell horseshoe type container for installation in an ejection seat. The NES-8B is used with an integrated torso suit harness which incorporates the aircrewman's parachute harness and provides attachment points for the lap and shoulder restraint straps. The harness is channeled through the torso suit to retain it in position and to facilitate donning.

When aboard the aircraft and seated, the aircrewman connects the quick-release fittings on the parachute riser assembly to the quick-release shoulder fittings on the integrated torso suit. The survival kit and lap restraint straps are also connected to the integrated torso suit by means of quick-release fittings.

The NES-8B parachute assembly is shown in figure 20-1.

OPERATION

After ejection, the ejection seat drogue gun fires a piston which deploys a controller drogue parachute. The controller drogue parachute, in turn, deploys the stabilizer drogue parachute. The stabilizer drogue parachute remains attached to the seat by a scissor shackle.

The scissor shackle is released at a preset altitude by the operation of the time release mechanism, and the aircrewman separates from the seat during this operation. When the stabilizer drogue parachute releases from the seat, it pulls the withdrawal line assembly from the container assembly. As the withdrawal line reaches full stretch, the ripcord locking pins are removed from the locking cones, permitting the grommets, locking cones, and end tabs to disengage. The container spring opening bands pull the end and side flaps apart, allowing the withdrawal line, which is attached to the peak of the main canopy, to extract and deploy the main canopy.

Should the ejection seat time release mechanism fail to operate, the aircrewman can manually disengage himself from the seat by pulling the emergency harness release handle. In this case the guillotine assembly will cut the withdrawal line securing the drogue parachutes to the pilot chute. The aircrewman must then push himself clear of the seat and pull the manual ripcord handle, deploying the pilot parachute which deploys the canopy.

The aircrewman falling away from the pilot parachute and drogue parachute causes the canopy to be pulled from the container assembly, followed by the suspension lines. The canopy starts to fill with air during this operation.

As load is applied, the riser fasteners are released and the lift webs are then pulled from the container assembly.

The connector link ties break and the canopy fully opens. The aircrewman hangs suspended in his harness from the quick-release shoulder fittings during descent.

Upon landing, the aircrewman can disengage the canopy and suspension lines from the integrated torso suit harness by using the quick-release shoulder fittings.

NOTE: The pulldown vent lines may break during high speed openings.

MODIFICATIONS AND UPDATING

The NES-8B personnel parachute assembly must be modified and updated when required by comparing the configuration of the assembly with applicable directives and NavAir 13-1-6.2.

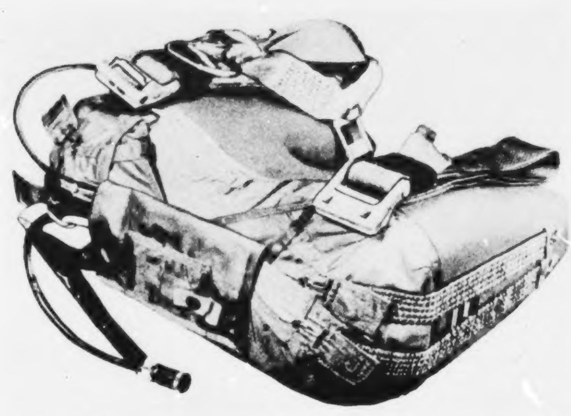

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Figure 20-1.–NES-8B parachute assembly.

Compliance with modifications to the NES-8B parachute assembly must be performed by intermediate or depot levels of maintenance. All modifications normally will have the information recorded on the parachute history card and other records in accordance with NavAir 13-1-6.2 and OPNAVINST. 4790.2.

RIGGING AND PACKING THE NES-8B PARACHUTE

Lay out the packing tools on the packing table and inspect them for nicks, burrs or sharp edges which may damage the parachute assembly. Count and record the number of packing tools.

Lay out the canopy assembly full length on a clean packing table. Locate the canopy gore containing the nameplate and position it uppermost in the center of the packing table. Separate the suspension lines into two equal groups, counting 14 suspension lines on each side of the nameplate gore. The vent lines must be equally divided on each side of the nameplate gore.

The two groups, of 14 suspension lines each, are arranged as shown in figure 20-2. The numbers in figure 20-2 illustrate the location and orientation of the suspension lines as attached to the skirt hem and the connector links.

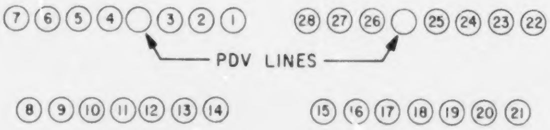

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Figure 20-2.–Suspension line continuity.

Place the connector link holding suspension lines 1 through 7 on top of the connector link holding suspension lines 8 through 14. Place the connector link holding suspension lines 22 through 28 on top of the connector link holding suspension lines 15 through 21. Connect these two groups of connector links to their respective tension hooks on the packing table.

NOTE: Insure that the knurled portions of the connector link yoke and plate assemblies face up and the screwheads face outboard.

Pass a messenger, approximately 16 feet of type III nylon cord (MIL-C-5040), down the center of the canopy, on the inside, to the peak. Extend the cord 1 foot beyond the skirt hem and the canopy peak.

Attach the end of the type III nylon cord to the large loop end of the PDV lines at the skirt hem.

SUSPENSION LINE CONTINUITY CHECK

Attach the tension strap to the canopy vent lines and tighten. When viewed from the riser end of the packing table, the suspension lines must be arranged on the skirt hem and the connector links in accordance with figure 20-2. They must run from the skirt hem of the canopy to the connector links without dips or twists.

NOTE: On other than original issue parachutes, the pulldown vent (PDV) lines, risers, and the cross connector straps will be attached to the connector links.

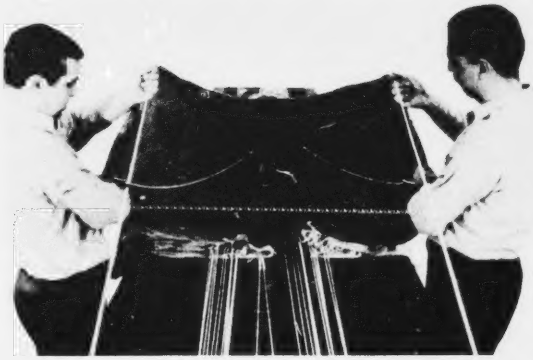

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Figure 20-3.—Whipping a canopy gore.

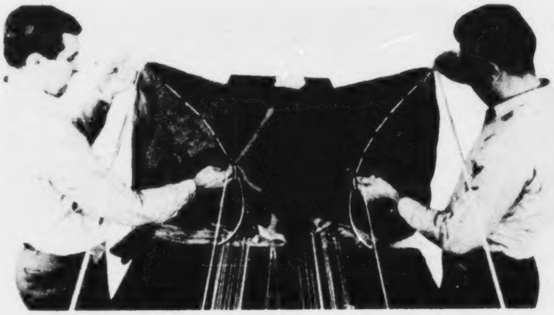

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Figure 20-4.—Using a rapid, circular motion in the whipping procedure

The packer, starting with suspension line 1 on the left side of the nameplate gore, must work through line number 14. The helper must be positioned at the connector links to check the suspension lines selected by the packer for continuity, dips, and twists. The same procedure is used on the right side of the nameplate gore, except that the packer will start with suspension line 28 and work through line number 15. If attached, the PDV lines are connected at the top connector links between lines 3 and 4 and lines 25 and 26, as applicable. They must run under the top suspension lines to the type III messenger cord without twisting around any suspension line.

WHIPPING AND FOLDING THE CANOPY GORES

NOTE: During the rigging and packing procedures, the packer is positioned on the left side of the packing table and the helper is on the right when facing the canopy from the harness/riser end of the packing table.

Insure that the tension strap is tightened at the canopy peak. The packer and helper must lift the suspension line on each side of the nameplate gore up and out. The skirt hem between lines should be held taut so that the canopy peak can be seen on the inside. While holding the suspension lines up, each man whips the gore hanging from the suspension line outward to prepare the canopy for folding. (See fig. 20-3.)

Draw the next suspension line upward to the suspension line held in the hand, using a rapid, circular motion as shown in figure 20-4.

Continue whipping and folding the remaining gores. Move the gores rapidly back and forth across the packing table. Insure that no radial seams are overlapped by any gore material.

The two groups of suspension lines must be stretched to the edges of the packing table with the folded gores hanging over the sides. The packer and helper must grasp all the folds at the outer edges on the skirt hem and hold the suspension line groups at the edges of the packing table. The packer and helper should simultaneously move the folds up and down rapidly, in a whipping motion, to eliminate any wrinkles.

The packer flaps the top gore up and down at the skirt hem center as the helper holds the bottom gore at the skirt hem center. On signal, both men must draw their respective gores, at the skirt hem centers, toward the table edge, while at the same time bringing the suspension line groups to the center of the packing table.

The suspension line groups are inserted into their respective slots in the suspension line separator and a shot bag is placed on the lines. The packer places a second shot bag across the skirt hem on the left side of the suspension lines, and the PDV lines are routed underneath the suspension line separator.

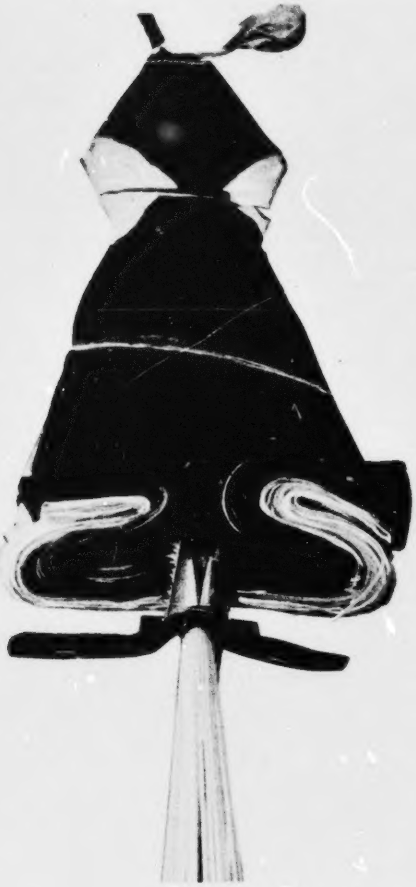

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Figure 20-5 –Canopy S-folded.

The helper now rotates all gores as a group, except the bottom gore, from the right over to the left side of the packing table. The helper must straighten and smooth the bottom gore on the right side of the packing table throughout its length to the peak. The packer returns the folded gores above the shot bag to the right side of the packing table and the helper straightens and smooths the top gore and places the shot bag on the skirt hem.

The packer must rotate all gores as a group, except the bottom gore, from left over to the right side of the packing table. The packer straightens and smooths the bottom gore on the left side of the packing table throughout its length to the peak. The helper returns all folded gores above the shot bag to the left side of the packing table and the packer straightens and smooths the top gore.

The packer and helper grasp the skirt hem at midsections of the gores and rotate towards the suspension lines. Each fold must be alined and counted when placed back onto the packing table.

The skirt hem must be made neat by having all "V" tab reinforcements alined in the same direction on top of each other. Each group of folds on the left and right of suspension lines must contain 14 gores.

The packer and helper grasp the skirt hem and folded gores and S-fold the canopy towards the center. Butt the S-folds together. The canopy cannot be S-folded throughout its entire length, but will break at a point approximately two-thirds of the distance to the peak, as shown in figure 20-5.

SUSPENSION LINE STOWAGE

Remove the tension strap from the canopy peak but not from the PDV line tension cord.

The helper must grasp the suspension lines, excluding the PDV lines, 14 1/2 feet from the connector links and spread each group to the edge of the packing table. (See fig. 20-6.)

While the helper holds the suspension lines at the edges of the table, the packer draws the canopy down the center of the packing table, between the suspension lines, to a point where the suspension lines between the helper's hands and the skirt hem become taut. At this point the PDV lines should protrude through the vent hem. If the PDV lines do not appear at the vent hem, adjust the canopy position until they do.

Remove the type III nylon messenger cord from the PDV lines.

Pass the pilot parachute connector cord around the vent lines and through the loops in the ends of the PDV lines. Pass the pilot parachute through the loop in the ends of the connector cord and draw tight. Pass the loop end of the withdrawal line around the vent lines and through the PDV lines to the left of the pilot parachute connector cord. Pass the free end of

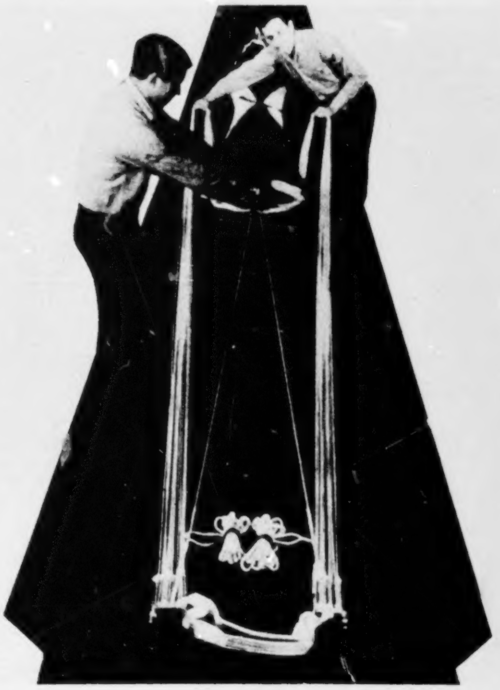

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Figure 20-6.–Suspension lines position on the packing table.

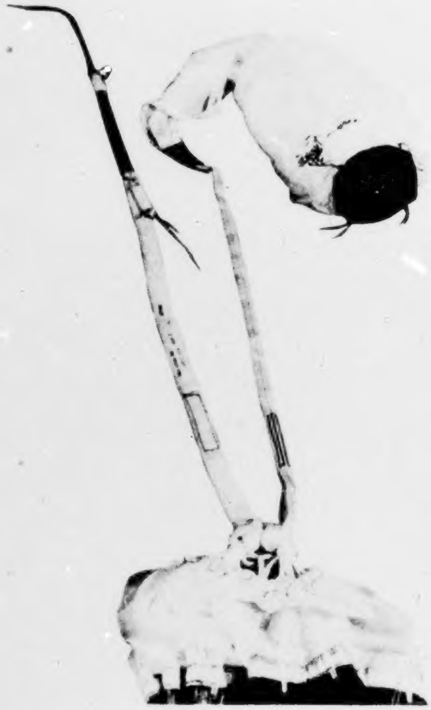

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Figure 20-7.–Attachment of pilot parachute connector cord, withdrawal line, and pull down vent lines.

the withdrawal line through the loop and draw tight. The ripcord pins must be facing up when the withdrawal line is drawn tight. (See fig. 20-7.)

Position the stowage tray under the suspension lines 5 inches from the connector links, with the retention angles turned upward as shown in figure 20-8.

The packer and helper must each pass a length of stowage aid line through the second outboard stowage channels and form the first bight in the suspension lines. Do not stow the PDV lines. (See fig. 20-9.)

The packer and helper must draw bights through the outboard channels to the edge of the stowage tray. Continue stowing the suspension lines to the center of the tray, excluding the PDV lines. Do not stow the two center stowage tray channels. (See fig. 20-10.)

Turn the stowage tray toward the canopy so that the retention angles face down, as shown in figure 20-11.

Begin stowing the suspension lines in the number six stowage channels, counting from the outboard edges of the tray. Do not stow the PDV lines. (See fig. 20-12.)

Continue stowing suspension lines to the outboard edges of the tray. Begin stowing the PDV lines in the third stowage channels from the outboard edges of the stowage tray, as shown in figure 20-13.

When the stowage channels are filled, there should be approximately 18 inches of line between the stowage tray and the canopy skirt hem. (See fig. 20-14.)

Collateral duty inspection (CDI) requirements must be performed at the specific steps as noted

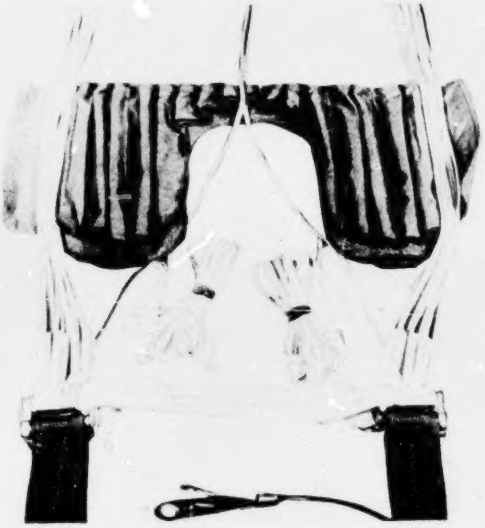

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Figure 20-8.—Stowage tray positioning.

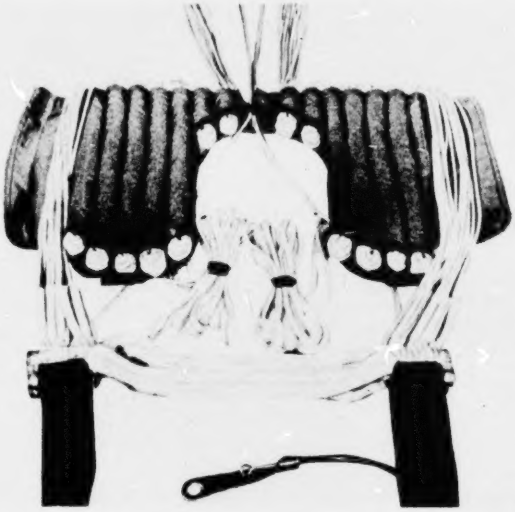

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Figure 20-10.—Suspension lines stowed to tray center.

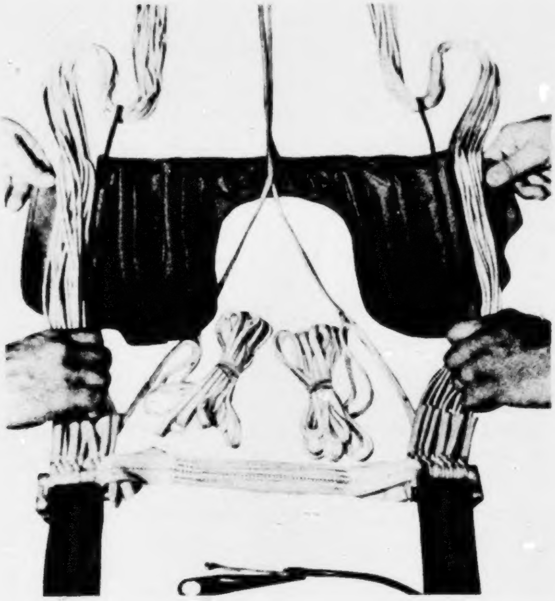

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Figure 20-9.—Forming the first bight of suspension lines.

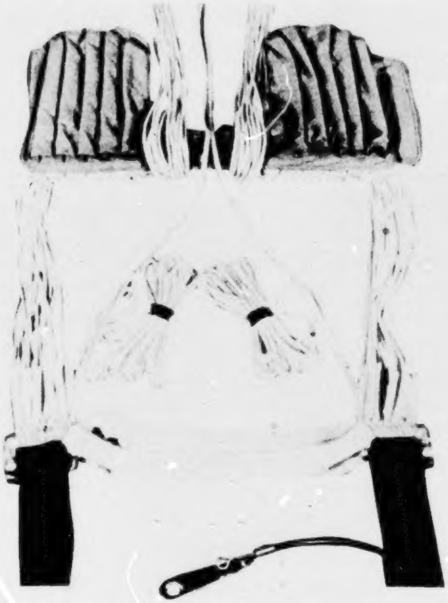

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Figure 20-11.—Stowage tray inverted.

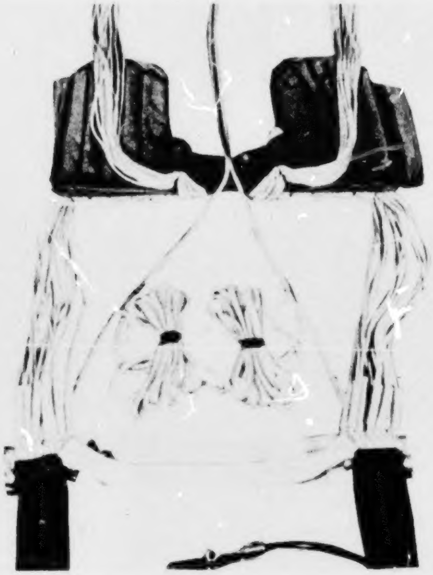

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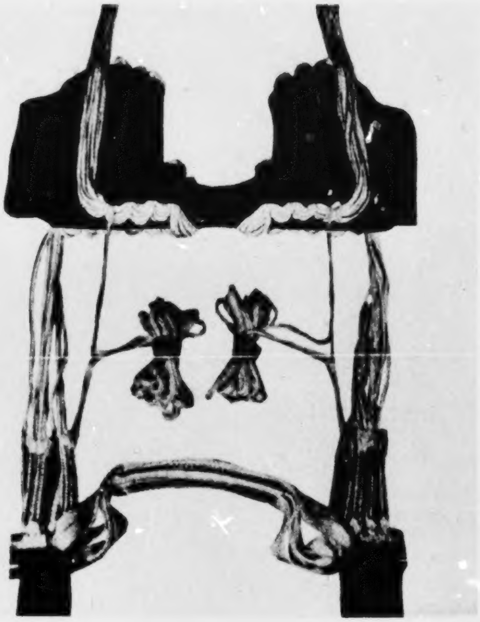
Figure 20-12.—Sixth stowage channel stowage.



PR.431
Figure 20-13.—Stowing PDV lines.

in the applicable Shop Process Cards, and the Personnel Parachute Manual, NavAir 13-1-6.2.

ATTACHMENT OF STOWAGE TRAY AND RISER ASSEMBLY TO THE CONTAINER

To attach the stowage tray and riser assembly to the container, proceed as follows:

1. Remove the connector links from the tension hooks.

NOTE: All tacking cord must be coated with a mixture of 50 percent paraffin and 50 percent beeswax except where noted. The cord may be dipped in a melting pot (160° to 200° Fahrenheit) or drawn across a solid block of the mixture.

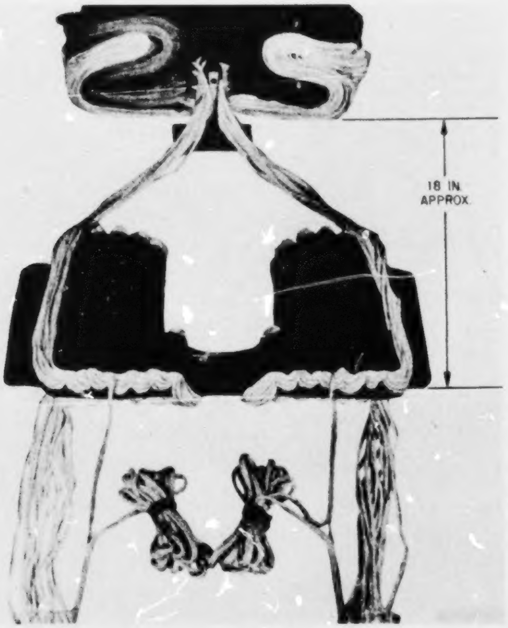
2. Tie the connector links together on each side using waxed size FF nylon cord, single. Tie the ends with a surgeon's knot followed by a square knot.

3. Rotate the riser assembly and stowage tray over toward the canopy, so the retention angles face up and the rounded end of the tray is turned away from the canopy. Position the container on the table with the open end facing the tray and the side flap containing the ripcord protector flap facing the packing table, as shown in figure 20-15.

Attach and crimp one end of each of the container spring opening bands to the container eyes with the hook facing down.

4. Slide the container toward the canopy, inserting the stowage tray into the container. Do not move the tray toward the container. Insure that the suspension lines do not become trapped under the tray retaining angles. The pilot parachute kickplate must not be wedged between the stowage tray and container.

5. Aline the threaded holes in the stowage tray retaining angles with the holes in the bottom of the container legs. Aline the brackets



PR.432

Figure 20-14.–Stowage tray filled.

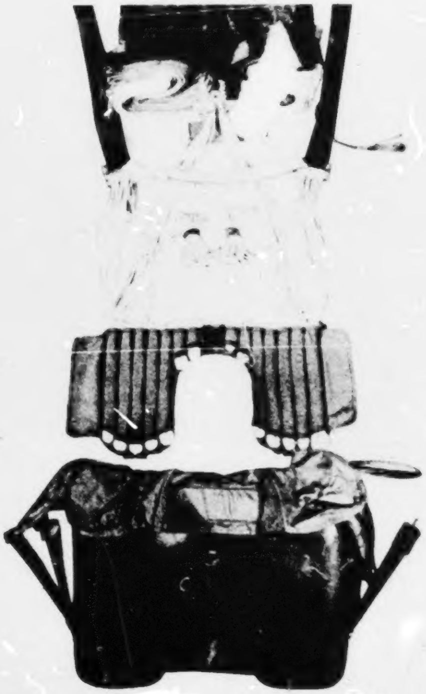
on the container retention straps above the holes in the bottom of the container legs. Insert screws through the washers and retention strap brackets and the holes in the container legs. Thread the screws into the retaining angles and tighten. Insure that the retention strap bracket is turned upward. (See fig. 20-16.)

6. Place the container in the container stand. Attach the hook, tape patches on the risers to the pile tape patches on the inside of the container. Stow the line between the connector links and stowage tray in the bottom of the container legs. Stow the line between the stowage tray and canopy skirt hem behind the stowage tray, as shown in figure 20-17.

CANOPY STOWAGE

To stow the parachute canopy in the container, proceed as follows:

1. Remove the shot bag from the skirt hem.



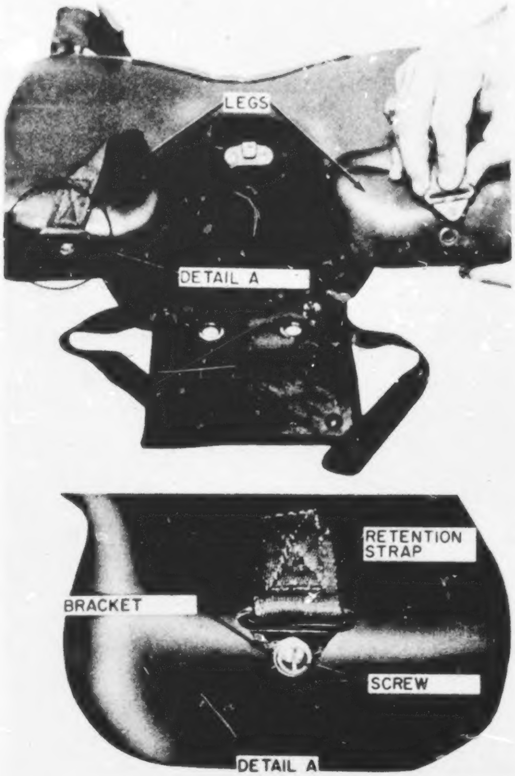
PR.434

Figure 20-15.–Positioning the stowage tray and container.

2. Spread the suspension line groups approximately 6 inches and fold the skirt hem under 4 inches. Place the folded skirt hem on top of the container. Press the folded skirt hem firmly down into respective legs of the container. (See fig. 20-18.)

3. Accordion-fold all but approximately 6 feet of the canopy into the container. Separately press each accordion fold firmly into the legs of the container. Accordion-fold the remainder of the canopy on the packing table, starting with the first fold on the packer's side and ending with the canopy peak on the kickplate side of the container. The accordion folds must extend 3 inches over the side of the container.

4. Position the accordion-folded canopy on top of the container. Insure that the canopy


LEGS
DETAIL A
RETENTION STRAP
BRACKET
SCREW
DETAIL A

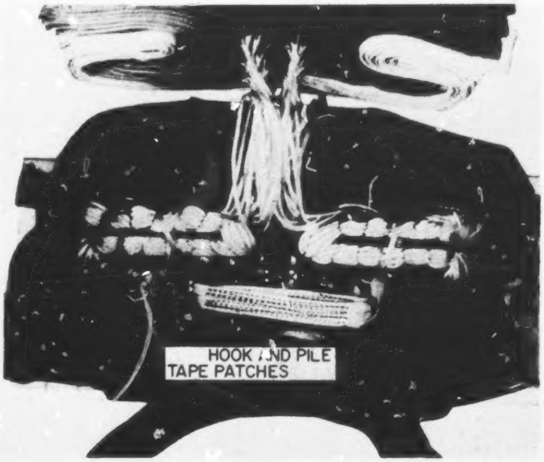
PR.435

Figure 20-16.—Alinement of stowage tray and container legs.

peak is positioned at the kickplate side of the container. Route the withdrawal line to the rear center of the container and back toward the pack. The ripcord pins must face up.

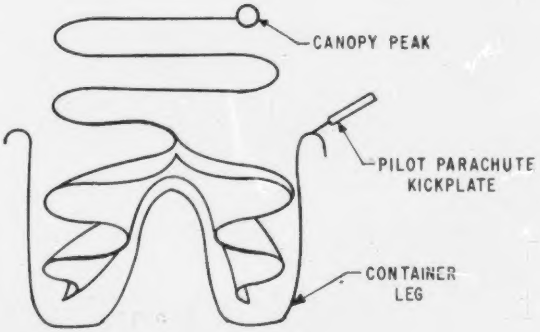
CLOSING THE CONTAINER

Pull the side flap with the locking cones over the top of the folded canopy. Pull the side flap with the grommets over the top side flap containing the locking cones and place the grommets over the locking cones. Insert the temporary locking pins into the locking cones from the proper direction.


HOOK AND PILE TAPE PATCHES

PR.436

Figure 20-17.—Suspension line stowage completed.

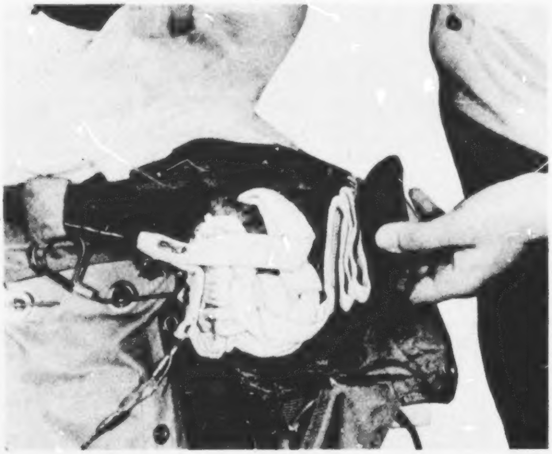

CANOPY PEAK
PILOT PARACHUTE KICKPLATE
CONTAINER LEG

PR.437

Figure 20-18.—Stowage of canopy.

Remove the temporary locking pin located on the packer's side and place the grommet on the end flap over the locking cone, between the side flaps.

Place the side flap grommet back over the locking cone and place the metal end tab over



PR.438

Figure 20-19.–Positioning of the connector cord.

the grommet and locking cone. Reinsert the temporary locking pin.

Insert the guide tube through the grommet in the crown of the pilot parachute and place it over the locking cone on the spring baseplate. Compress the pilot parachute fully, remove the guide tube, and insert the pilot parachute temporary locking pin into the locking cone hole.

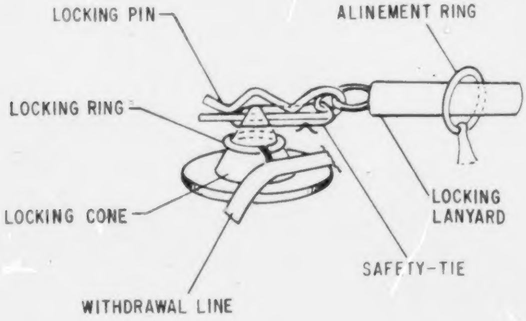
S-fold the pilot parachute connector cord under the kickplate on the helper's side. The connector must exit from the rear of the kickplate. Fold the excess withdrawal line, if any, under the kickplate, as shown in figure 20-19.

Place the pilot parachute kickplate on top of the canopy peak. Tuck the pilot parachute cloth under the pilot parachute crown and place the pilot parachute on top of the kickplate. The withdrawal line must exit from the rear of the helper's end flap.

Remove the temporary locking pin on the helper's side and pull the end flap over the compressed pilot chute. Route the withdrawal line out the rear of the container. Remove the grommet side flap from the locking cone and place the grommet over the locking cone. Place the end tab over the locking cone and reinsert the temporary locking pin. Insert the riser protective flaps into the container using a packing fid.

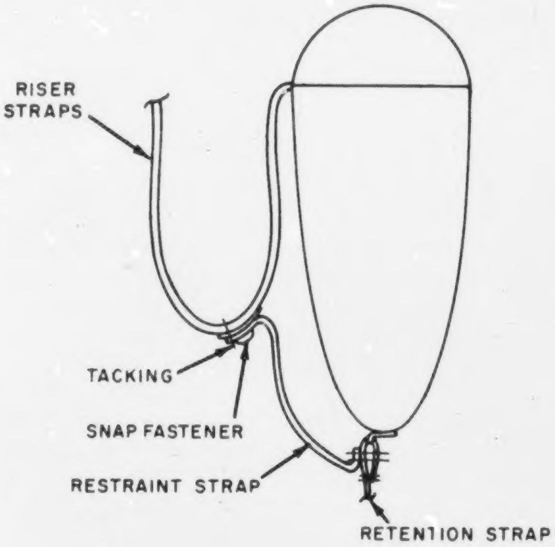
Insert the ripcord anchor plate through the webbing loop on the end flap. The manual ripcord cable must pass over the loop. The helper holds the end tab over the locking cone on the withdrawal line end of the container and the packer removes the temporary locking pin. The packer will position the anchor plate over the locking cone and insert the temporary locking pin; removal of the pilot parachute temporary locking pin can now be made.

Route the ripcord pin line through the alinement ring on the end flap. Insert the curved



PR.419

Figure 20-20.–Position of the locking lanyard, alinement ring, locking pin, locking ring, and withdrawal line.



PR.413

Figure 20-21.—Mating snap fasteners on the restraint strap and risers.

ripcord pin through the eye on the end of the manual ripcord cable. The helper must insert a curved ripcord pin into the locking cone containing the anchor plate as the packer removes the temporary locking pin. Insert a straight ripcord pin into the second locking cone in the same manner.

Route the locking lanyard through the alinement ring. Place the locking ring over the locking cone and insert the locking pin into the locking cone.

Safety-tie the locking pin by passing a length of unwaxed size A nylon thread, single, under the end of the pin and through the loop formed at the back of the pin. Tie the ends with a surgeon's knot followed by a square knot. (See fig. 20-20.)

Mate the snap fasteners on the restraint straps to the snap fasteners on the risers. Tack through both riser lift webs and through the restraint strap using unwaxed, 3 ply cotton thread (V-T-276, type IIA), single. Tie ends with a surgeon's knot followed by a square knot. (See fig. 20-21.)

Route the manual ripcord housing under the forward container spring opening band.

Close the ripcord protector flap, remove the container from the stand, and attach the four container spring opening bands (two on each end of the container).

Crimp the hook at the container end to the eyelet. Do not crimp the flap end hook. Position the risers on top of the container and mate the hook and pile tape patches.

Count all of the packing tools, insuring that all are accounted for. Fill out and sign the Parachute History Card. The collateral duty inspector must initial the Parachute History Card.

CHAPTER 21

DROGUE PARACHUTE ASSEMBLIES

Drogue parachute assemblies are used to stabilize and decelerate the seat with an acceptable rate of altitude loss, and position the seat in a convenient attitude for aircrewman/seat separation.

MARTIN-BAKER DROGUE PARACHUTE ASSEMBLY

The Martin-Baker drogue parachute assembly consists of two parachutes; a 22-inch diameter controller drogue and a 5-foot diameter stabilizer drogue parachute; both are constructed and fabricated of cotton material. Both parachutes are connected in tandem by a connecting line and packed together within the headbox container.

FUNCTION

This drogue parachute assembly is actuated by a time release mechanism, which initiates the extraction of the aircrewman's personnel parachute from its container on most seats; it also releases the aircrewman's face curtain restraints and the personnel parachute slide disconnect static cable anchorage.

NOTE: For more detailed information on drogue parachute assemblies, refer to the Personnel Parachute Manual, NavAir 13-1-6.2.

RIGGING AND PACKING

The repack cycle for drogue parachutes coincides with the repack cycle of the personnel parachute.

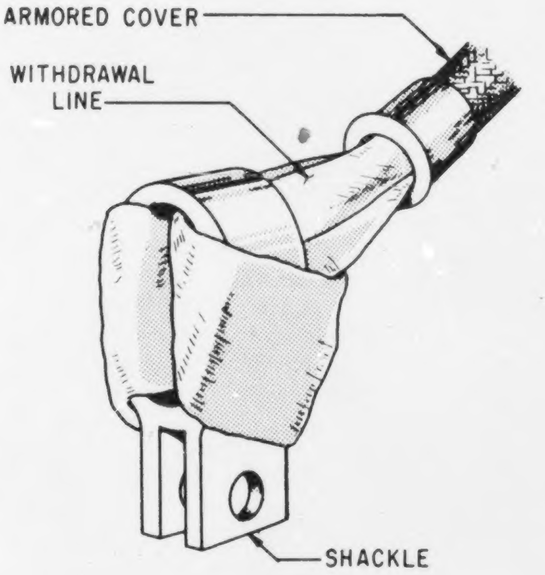
In consideration of the high dynamic forces to which the drogue parachute assemblies may be subjected, there are no repairs authorized. Any component of the system found to be defective or unserviceable must be replaced.

During the inspection phase, the date of manufacture will be noted and the date placed in service will be determined by the best available documentation; i.e., log book entry and history cards. In those cases where the date placed in service cannot be positively determined, the date of manufacture will be considered to be the date placed in service. The date placed in service (manufacturer's date) will then be entered in the log book and history cards where that date is missing as described for documentation purposes.

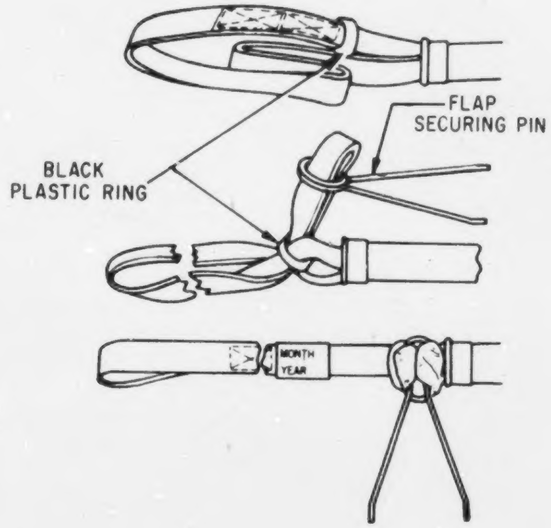
The Martin-Baker stabilizer drogue system service/age life is as follows:

1. The controller drogue parachute withdrawal line, main personnel parachute withdrawal line and extender strap will have an age life of 10 years from the date of manufacture and a service life to coincide with the progressive aircraft rework (PAR) cycle of the aircraft, not to exceed 24 months.
2. The 22-inch drogue parachute and the connecting line will have a service life of 7 years from the date placed in service or 10 years from the date of manufacture, whichever occurs first.
3. The 5-foot drogue parachute assemblies will have a service life of 2 years or 8 1/2 years from the date of manufacture, whichever occurs first.
4. The 5-foot drogue parachute assembly P/N 38271 will have a service life of 7 years or 10 years from the date of manufacture, whichever occurs first.
5. All metal components shall remain in service until they fail to meet the inspection criteria.

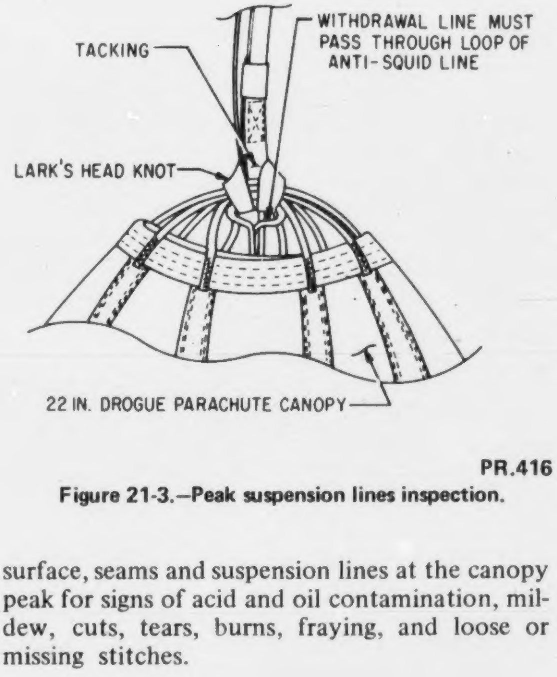
NOTE: Prior to commencing any work on drogue parachutes insure that the ejection seat is safetied and disarmed in accordance with the procedures of the applicable Maintenance Instruction Manuals.


ARMORED COVER
WITHDRAWAL LINE
SHACKLE

PR.414
Figure 21-1.—Inspection of the 22-inch drogue withdrawal line shackle.


FLAP SECURING PIN
BLACK PLASTIC RING
MONTH
YEAR

PR.415
Figure 21-2.—Flap securing pin inspection.


TACKING
WITHDRAWAL LINE MUST PASS THROUGH LOOP OF ANTI-SQUID LINE
LARK'S HEAD KNOT
22 IN. DROGUE PARACHUTE CANOPY

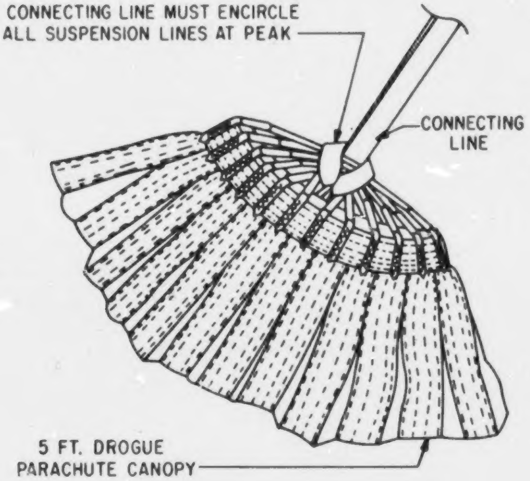
PR.416
Figure 21-3.—Peak suspension lines inspection.

To prepare the drogue parachute assembly for rigging and packing, inspect the 22-inch drogue withdrawal line shackle for nicks, burrs, corrosion, and proper attachment of the shackle to the withdrawal line. (See fig. 21-1.)

Inspect the armored cover for broken strands, security of the end ferrules and for presence of dirt and corrosion. Inspect the flap securing pin for nicks, burrs, dirt, corrosion, bends, and proper attachment to the lanyard. (See fig. 21-2.)

Insure that all the peak suspension lines and the anti-squid line are encircled by the withdrawal line with a lark's head knot. Replace the tacking if necessary with waxed 6-cord doubled, using a surgeon's knot followed by a square knot. (See fig. 21-3.)

Inspect the withdrawal line for contamination, cuts, fraying, burns, loose or broken stitching, and proper attachment of the withdrawal line to the 22-inch drogue parachute. Inspect the 22-inch drogue parachute fabric drag surface, seams and suspension lines at the canopy peak for signs of acid and oil contamination, mildew, cuts, tears, burns, fraying, and loose or missing stitches.


CONNECTING LINE MUST ENCIRCLE ALL SUSPENSION LINES AT PEAK
CONNECTING LINE
5 FT. DROGUE PARACHUTE CANOPY

PR.417

Figure 21-4.–Connecting line attachment to the peak suspension lines.

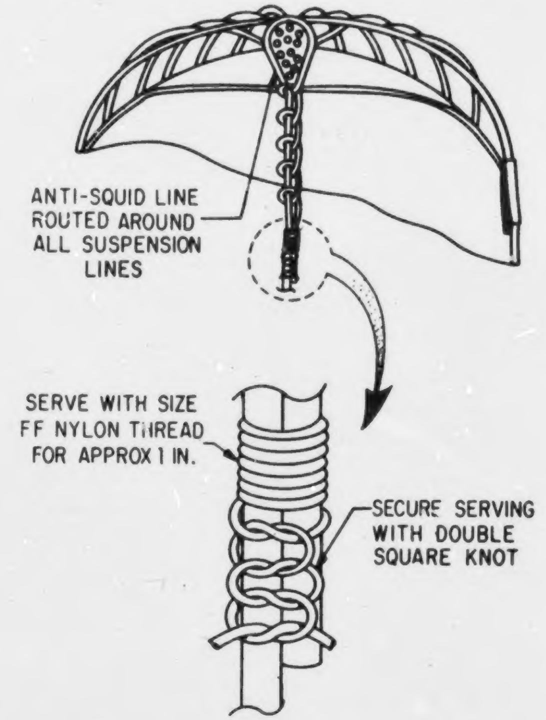
Inspect the anti-squid line for contamination, cuts, fraying, burns, loose or broken stitching, and security of attachment at the canopy peak and terminal eye. Inspect the suspension lines from the canopy skirt to the terminal eye for frays, ruptures, dirt, lumps, hard or thin spots, protruding inner core lines, presence of twists in individual lines, security of attachment at the skirt hem, and security and condition of the wrapping at the skirt terminal eye.

Inspect the drogue connecting line for contamination, cuts, fraying, burns, loose or broken stitching, and attachment of the connecting line to the 22-inch drogue parachute eye.

Insure that all peak suspension lines on the 5-foot drogue parachute are encircled by the lark's head knot formed by the connecting line as shown in figure 21-4.

Verify the incorporation of modifications and reidentification of correct part number on the 5-foot drogue parachute assembly.

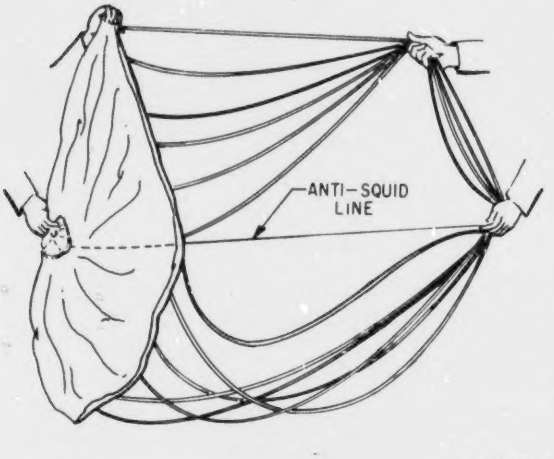
Inspect the 5-foot drogue parachute fabric drag surface, seams, and suspension lines for signs of acid and oil contamination, mildew, cuts, tears, burns, fraying, and loose or missing stitching. Inspect the anti-squid line for proper attachment at the canopy peak as shown in figure 21-5.


ANTI-SQUID LINE ROUTED AROUND ALL SUSPENSION LINES
SERVE WITH SIZE FF NYLON THREAD FOR APPROX 1 IN.
SECURE SERVING WITH DOUBLE SQUARE KNOT

PR.418

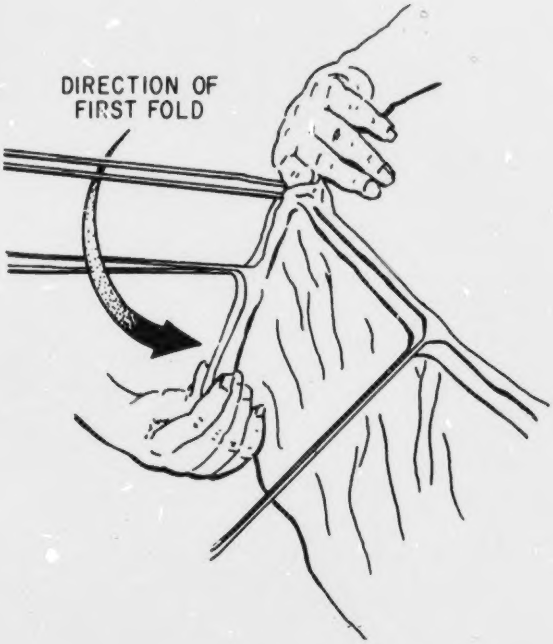
Figure 21-5.–Anti-squid line attachment to the canopy peak.

Inspect the suspension lines and the anti-squid line from the canopy skirt to the confluence point for frays, ruptures, dirt, lumps, hard or thin spots, protruding inner core lines, presence of twists in the individual lines, attachment of the suspension lines and V-tabs at the skirt hem, and security and condition of the wrapping at the confluence point. Inspect the braided tubular cover for frays, ruptures, dirt, lumps, hard or thin spots, security of the wrappings, and serving at the eye. Check the extension strap for contamination, cuts, fraying, burns, and loose or broken stitching. Inspect the drogue shackle for nicks, burrs, dirt, and corrosion. Check the attachment bolt and nut for nicks, burrs, dirt, corrosion, and stripped or scored threads.



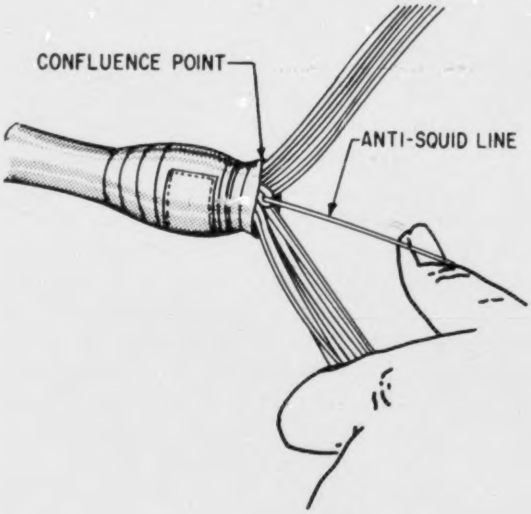
PR.439

Figure 21-6.—Positioning the suspension lines on either side of the anti-squid line.



PR.3

Figure 21-8.—Right side of canopy folds.



PR.2

Figure 21-7.—Alinement of suspension lines at the confluence point.

To rig and pack the Martin-Baker drogue parachute assembly, except those used in the TF-9J aircraft, open the four flaps and roll the protective sleeve down so that it does not obstruct the packing operation. Inspect the interior of the headbox container for foreign objects, corrosion, cleanliness, and structural integrity. Position the drogue shackle in the scissor shackle with the drogue shackle nut facing aft. Close the scissor shackle and cock the barostatic time release unit.

Extend the suspension lines from the drogue shackle and hold the main drogue in such a manner that the suspension lines fall into two groups of 12 lines each, with one group on either side of the anti-squid line as shown in figure 21-6.

Insure that the suspension lines are not crossed or entangled at the confluence point. (See fig. 21-7.)

Pair off the suspension lines and fold the right side of the canopy into single folds as shown in figure 21-8.

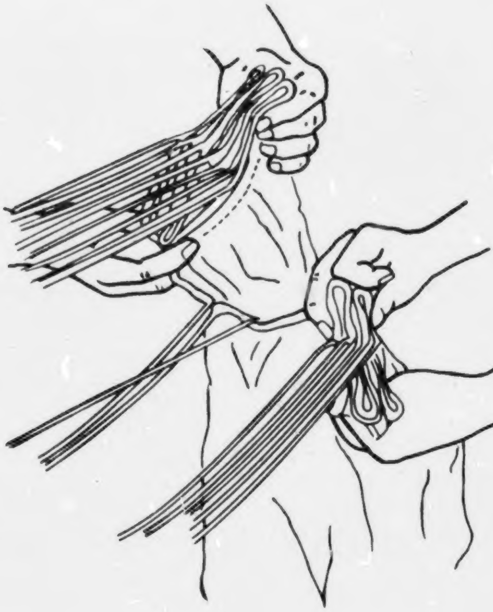


Figure 21-9.–Left side of canopy folds.

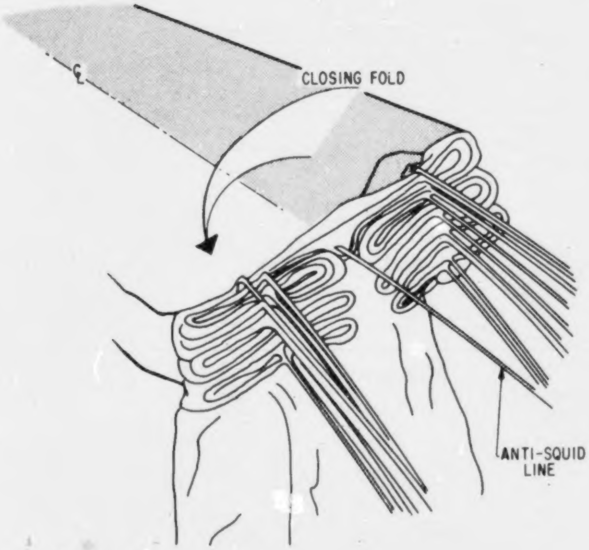


Figure 21-10.–Routing the anti-squid line between the two groups of suspension lines.

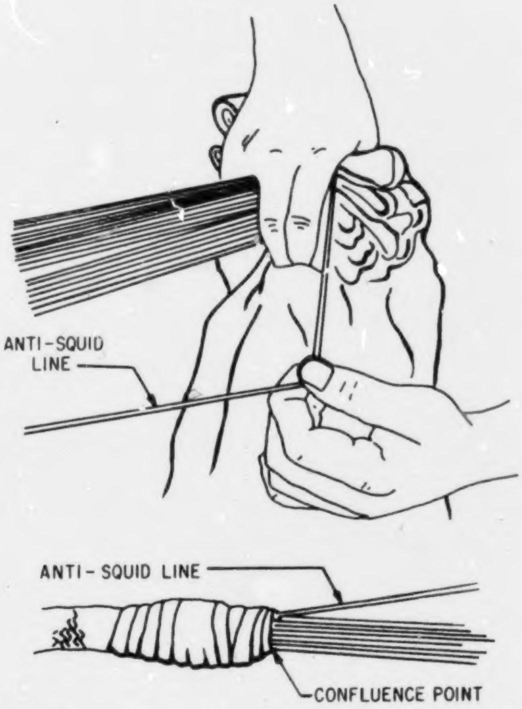


Figure 21-11.–Position of the anti-squid line.

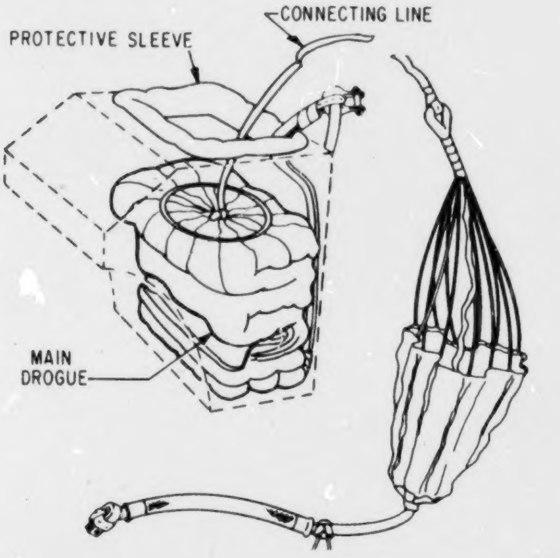
Retain the right half of the canopy and fold the left in the same manner as previously stated. (See fig. 21-9.)

Prior to folding the two halves of the canopy, route the anti-squid line between the two groups of suspension lines as shown in figure 21-10.

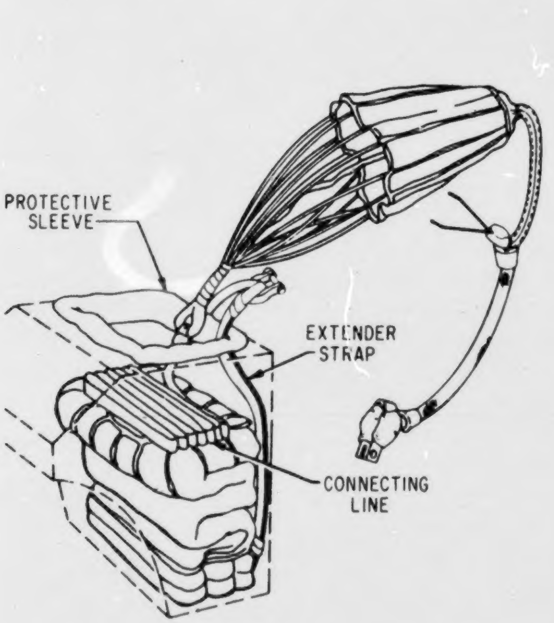
Fold the two halves of the canopy together and check the routing of the anti-squid line. (See fig. 21-11.)

Insert the tubular covered suspension lines into the rear left corner of the headbox container, fold the remaining suspension lines and the anti-squid line down into the container. Stow the 5-foot drogue canopy skirt accordion fashion well down into the container. Finish with the peak opened out, and laid flat. (See fig. 21-12.)

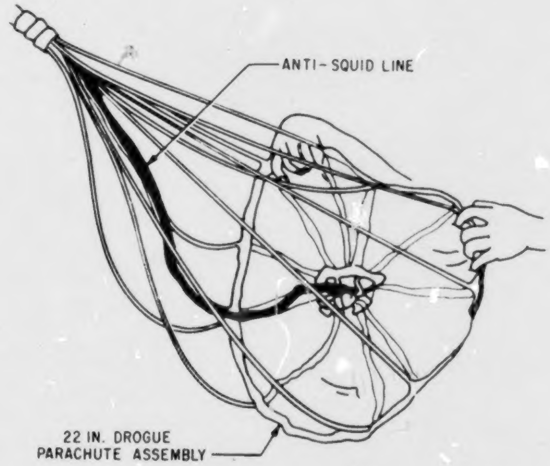
Insure that the connecting line is not twisted, lay the connecting line down from left to right


CONNECTING LINE
PROTECTIVE SLEEVE
MAIN DROGUE

PR.32
Figure 21-12.—Stowing the 5-foot drogue.


PROTECTIVE SLEEVE
EXTENDER STRAP
CONNECTING LINE

PR.33
Figure 21-13.—Stowing the connecting line.


ANTI-SQUID LINE
22 IN. DROGUE PARACHUTE ASSEMBLY

PR.34
Figure 21-14.—Anti-squid line position on the 22-inch drogue parachute.

on top of the stowed 5-foot drogue, working from the front to the rear as shown in figure 21-13.

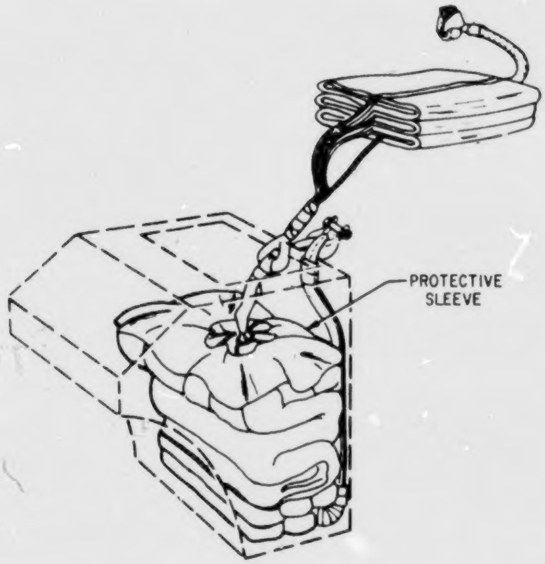
Unroll the protective sleeve and fold it over the 5-foot drogue and connecting line in such a manner that the 22-inch drogue parachute suspension lines emerge from the right corner of the container.

Stretch the 22-inch drogue parachute taut and check for proper routing of the anti-squid line as shown in figure 21-14.

Pair off the suspension lines and straighten the canopy. Pick up the skirt hem and make two accordion folds. Route the anti-squid line under these folds. Continue folding the canopy until all gores are folded as shown in figure 21-15.

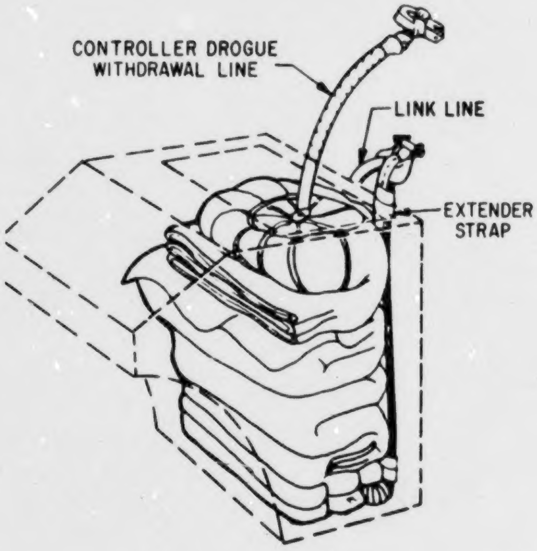
Stow the suspension lines and the anti-squid line in the forward edge of the container. Fold the canopy in half and place it in the container with the skirt hem forward. Lay the peak of the canopy flat with the withdrawal line extending from the container at the left side, rear. (See fig. 21-16.)

Allow 3 inches of the withdrawal line to be exposed between the corner of the container and the flap securing pin. Close, in order, the right,



PR.35

Figure 21-15.–Gores folded on the 22-inch drogue parachute.



PR.36

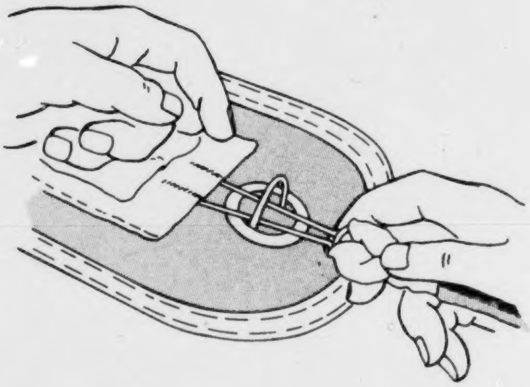
Figure 21-16.–Stowing the 22-inch drogue parachute withdrawal line in the container.

left, rear, and front flaps of the container with the wire loop on the right flap passing through the grommets of the other flaps. Insert the securing pin through the wire loop and into the fabric pocket on the front flap. (See fig. 21-17.)

Safety tie the flap securing pin with one turn of waxed nylon 6-cord single, route the safety tie through the pin loop and the fabric loop on the front flap. Tie off the safety tie with a surgeon's knot followed by a square knot.

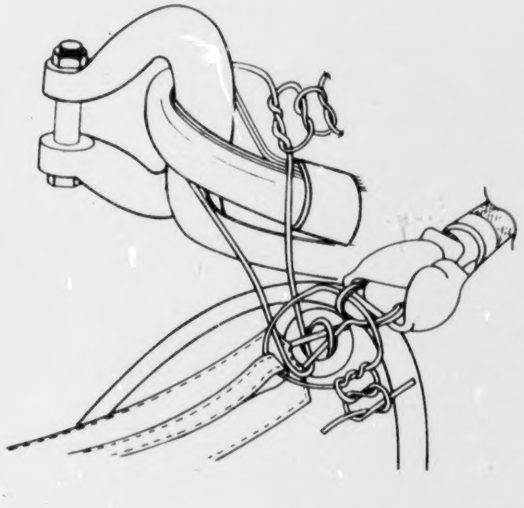
Rotate the scissor shackle forward so the drogue shackle and the drogue eye (or extension strap loops) lie on top of the flaps. Safety tie the shackle with one turn of waxed nylon 6-cord single, routed through the eye of the drogue (or both loops of the extension strap), through the shackle, and around both legs of the securing pin forward of the wire loop. Tie off the ends with a surgeon's knot followed by a square knot. (See fig. 21-18.)

Complete the installation and interface the attachments in accordance with the applicable Maintenance Instruction Manual.



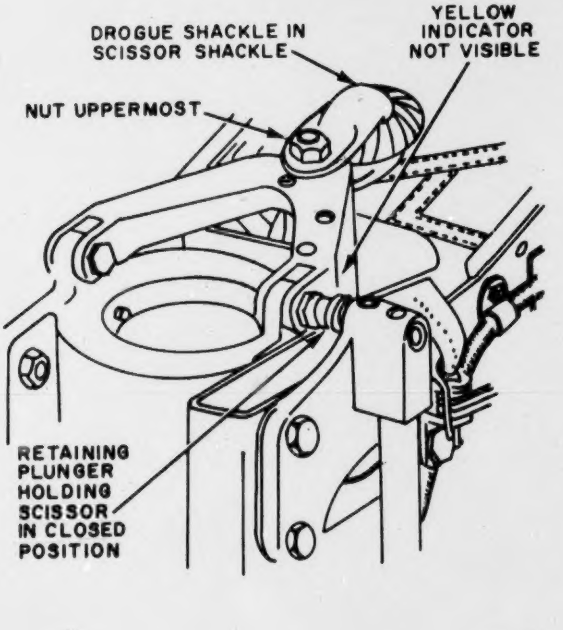
PR.37

Figure 21-17.–Securing pin placed through the wire loop.



PR.57

Figure 21-18.—Safety tying the drogue shackle.


DROGUE SHACKLE IN SCISSOR SHACKLE
YELLOW INDICATOR NOT VISIBLE
NUT UPPERMOST
RETAINING PLUNGER HOLDING SCISSOR IN CLOSED POSITION

PR.472

Figure 21-19.—Closed scissor shackle.

To rig and pack the Martin-Baker drogue parachutes for the MK-A7 seat in the TF-9J aircraft, open the four flaps and roll the protective sleeve down so that it does not obstruct the packing operation. Inspect the interior of the headbox container for foreign objects, corrosion, cleanliness, and structural integrity.

Position the drogue shackle in the scissor shackle with the drogue shackle nut facing aft. Close the scissor shackle and cock the barostatic time release unit. (See fig. 21-19.)

Extend the suspension lines from the drogue shackle and hold the main drogue in such a manner that the suspension lines fall into two groups of 12 lines each, with one group on either side of the anti squid line.

Insure that the suspension lines are not crossed or entangled at the confluence point. Keep the anti-squid line clear of the suspension lines during the folding of the canopy.

Pair off the suspension lines and fold the right side of the canopy into single folds. Retain the right half of the canopy and fold the left half in the same manner as used for the right half. Prior to folding the two halves of the canopy, route the anti-squid line between the two groups of suspension lines.

NOTE: Suspension line slack must be located at the confluence point rather than at the canopy hem.

Insert the tubular covered suspension lines into the right rear corner of the headbox container and fold the remaining suspension lines and the anti-squid line down into the container.

Stow the 5-foot drogue canopy skirt accordion fashion well down into the container. Finish with the peak opened out, laid flat and centered. Insure that the connecting line is not twisted, lay it down from left to right on top of the 5-foot drogue, working from front to rear. Unroll the protective sleeve and fold it over the 5-foot drogue and connecting line in such a manner that the 22-inch drogue parachute suspension lines emerge from the right rear corner of the container. Stretch the 22-inch drogue parachute taut and check for proper routing of the anti-squid line. Pair off the suspension lines and straighten the canopy. Pick up the skirt hem and make two accordion folds, then route the anti-squid line under these folds. Continue folding the canopy until all of the gores are folded.

Stow the suspension lines and the anti-squid line in the forward edge of the container. Fold the canopy in half and place it in the container with the skirt hem forward. Lay the peak of the canopy flat with the withdrawal line extending from the container at the left rear.

Close the rear, left, and right drogue retaining flaps in that order, insuring that the wire loop of the rear flap passes through the eyelets of the left and right flaps. Pass the face curtain and secondary firing cables over the right flap, to the right of the wire loop, and over the black covered portion of the attachment line. (See fig. 21-20.)

Close the front flap and pass the legs of the flap retaining pin through the wire loop and into the sleeve on the front flap.

Ease the black covered portion of the attachment line forward and lower the scissor shackle. Push any excess drogue withdrawal line back into the container. Using the flat of the hand, strike the drogue shackle to force the excess connector line back into the container until such time as the scissor contacts the shackle stop. Insure that the drogue shackle is turned approximately 45 degrees to the right as viewed from aft to forward. Insure that the drogue is tightly packed in order to place the drogue scissor shackle plate as close as possible to the contact stop to assure shackle canopy clearance.

Safety tie the flap securing pin to the fabric loop on the front flap; tie with a surgeon's knot followed by a square knot. The drogue shackle and attachment line safety tie must not pass through the wire loop on the rear flap.

With the scissor shackle in the full down position, pass a length of cord through both the connector line loop and the drogue shackle as shown in figure 21-21. Pass one end of the thread under the legs flap securing pin immediately forward of the wire loop; pass the same end back over both legs of the securing pin but under the securing pin tie. Pull the thread tight and tie off with a surgeon's knot followed by a square knot.

Pass one end of a length of thread between the legs of the flap retaining pin and the retaining pin tie, forward of the wire loop, routing the thread around the back of the wire loop and beneath the flap securing pin and the securing pin tie. Take a turn around the attachment line with each end of the thread; insure that the attachment line is positioned to the rear of the right

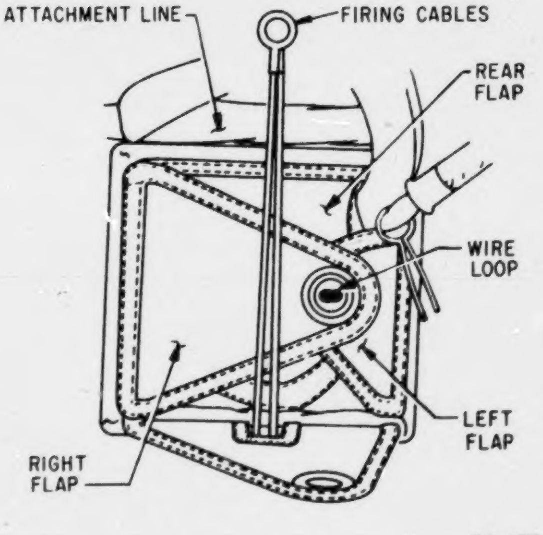


Figure 21-20.—Closing the retaining flaps.

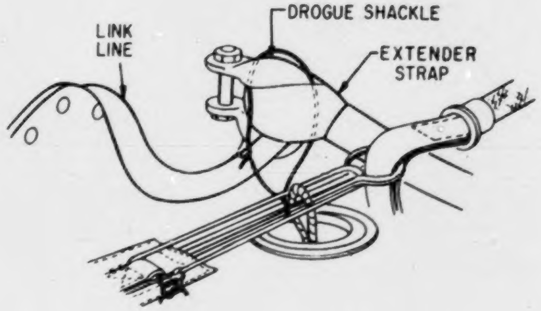


Figure 21-21.—Connector line loop and drogue shackle tie.

canopy breaker; pull the thread tight; and tie off with a double reef knot. (See fig. 21-22.)

WARNING: The drogue withdrawal line must pass over all other lines; otherwise the drogues may not deploy during ejection sequence.

Connect the drogue withdrawal line to the drogue gun piston; insure that the withdrawal line passes over all other lines; secure the drogue gun piston bolt with lockwire; and refit the personnel parachute.

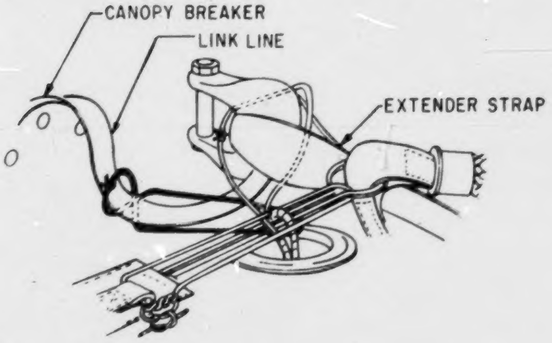
NORTH AMERICAN DROGUE PARACHUTE ASSEMBLIES

The North American ejection seat stabilization drogue parachutes used in the HS-1 seat (RA-5C) and the LS-1 seat (T2-B) are made of nylon fabric, 52 inches in diameter, and are of ribless guide-surface type. The canopy consists of 12 gores and 12 suspension lines. The risers are made of nylon webbing and the ends are covered with leather buffers. (See fig. 21-23, HS-1 seat.)

The North American drogue parachute assembly used for the LS-1 seat is shown in figure 21-24.

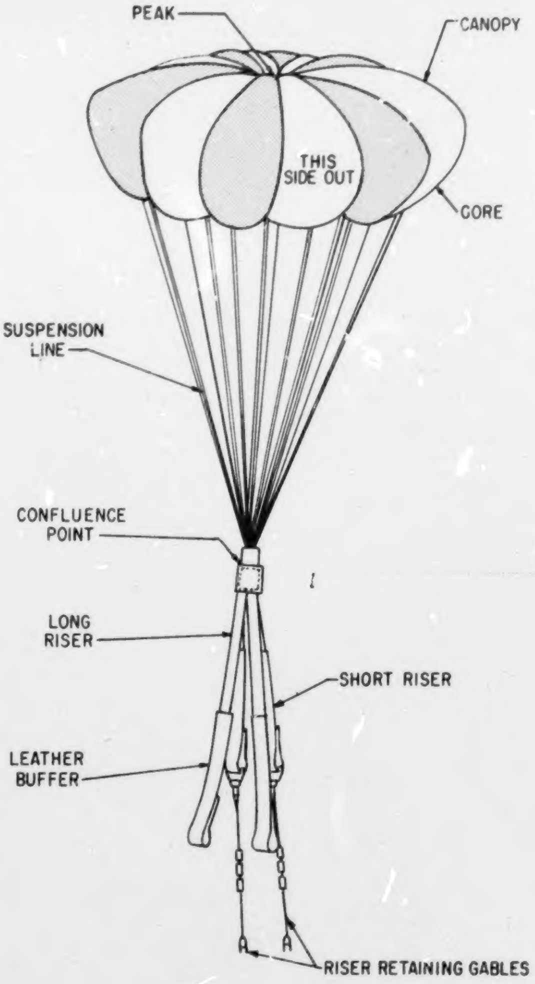
FUNCTION

The North American drogue parachute used in the RA-5C aircraft is deployed when the upward travel of the seat pulls a cable from the tube assembly. The cable then actuates the sear pin on the thruster initiator. The initiator actuates the drogue parachute thruster cartridge and ejects the drogue chute container. As the container leaves the seat, the drogue chute risers pull the drogue chute from the container and the drogue chute then pulls out the pilot parachute of the NB-7E personnel parachute.



PR.475

Figure 21-22.—Attachment line tie off.



PR.476

Figure 21-23.—North American drogue parachute assembly, HS-1 seat.

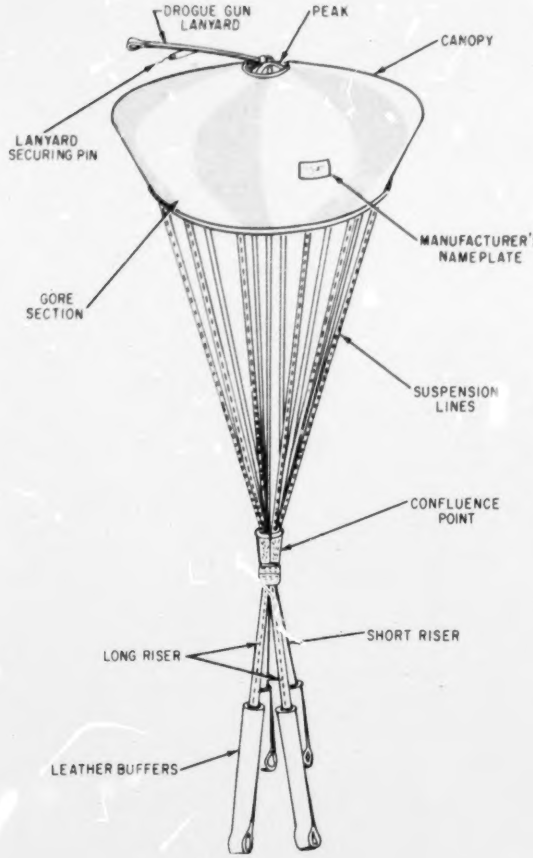


Figure 21-24.—North American drogue parachute assembly, LS-1 seat.

The North American drogue parachute used in the T2-B aircraft is deployed when the seat, traveling up the rails, actuates a bell crank and linkage arrangement. Actuation of the bell crank pulls a link connected to the sear pin of the drogue gun. The sear pin actuates the drogue gun firing mechanism, which fires the gun, and pulls the drogue chute out of its container. There are no modifications authorized for the North American drogue parachute assemblies, and no repairs are allowed; replace any component of the system found to be defective or unserviceable.

Repack cycle for the drogue parachute will coincide with the repack cycle of the personnel parachute.

RIGGING AND PACKING

During the inspection phase, the date of manufacture will be noted and the date placed in service will be determined by the best available documentation; i.e., log book entry and history cards. In those cases where the date placed in service cannot be positively determined, the date of manufacture will be considered to be the date placed in service. The date placed in service (manufacturer's date) will then be entered in the log book and history cards where that date is missing as described for documentation purposes.

The drogue parachute has a service life of 7 years from the date it is placed in service or 10 years from the date of manufacture, whichever occurs first. All metal components shall remain in service until they fail to meet the inspection criteria.

NOTE: Prior to commencing any work on drogue parachutes insure that the ejection seat is safetied and disarmed in accordance with the procedures of the applicable Maintenance Instruction Manuals.

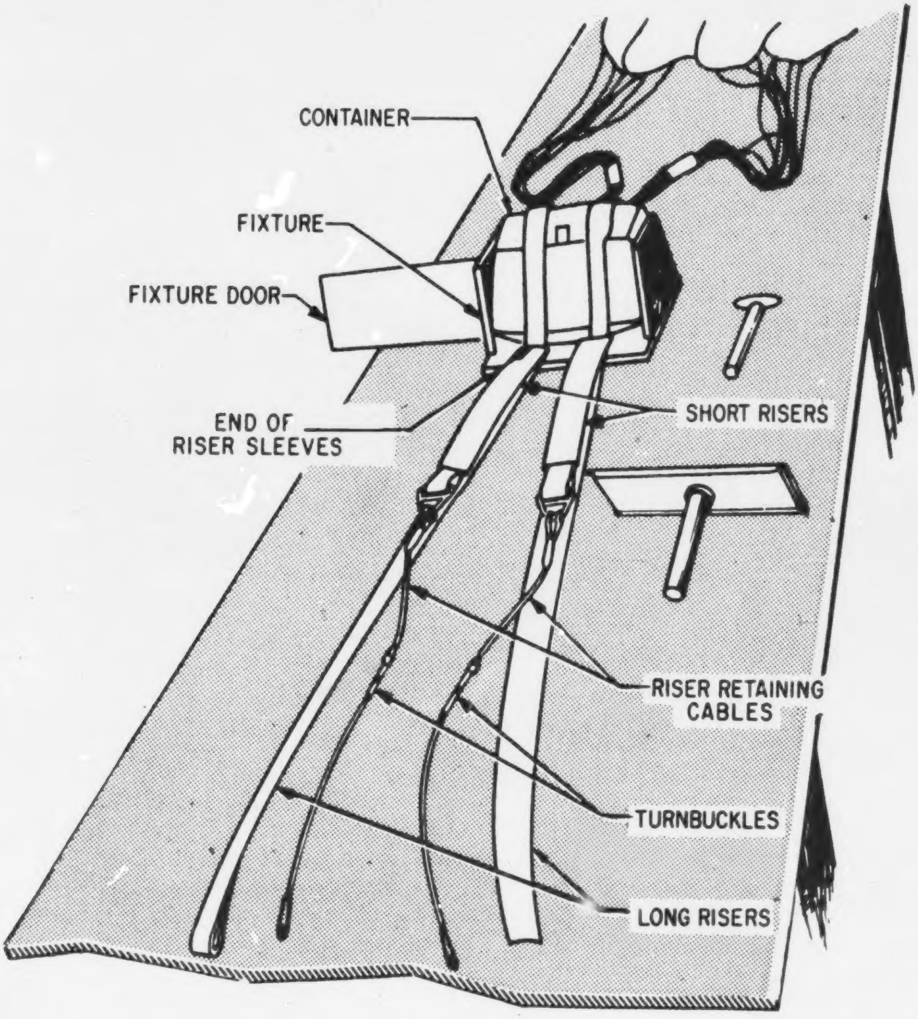
To inspect the North American seat stabilizer drogue parachute assemblies, check the withdrawal lanyard for cuts, fraying, burns, loose or broken stitching, and proper attachment to the drogue parachute, LS-1 seat only. Inspect the lanyard securing pin for nicks, burrs, dirt, corrosion, bends, and proper attachment to the lanyard, LS-1 seat only.

Inspect the canopy drag surface, seams, and suspension lines at the peak for signs of acid and oil contamination, mildew, cuts, tears, burns, fraying, and loose or missing stitches. Inspect the suspension lines from the skirt hem to the confluence point for frays, dirt, ruptures, lumps, hard or thin spots, presence of twists in the individual lines, and security of attachment at the skirt hem. Inspect the risers for contamination, cuts, fraying, burns, loose or broken stitching, and attachment of the risers to the suspension lines at the confluence point. Inspect the leather buffers for security of attachment and cuts, cracks, and fraying. Inspect the retaining cables for corrosion, bends, dents, nicks, cuts, and security of attachment for the HS-1 seat only.

To rig and pack the North American drogue parachute used in the HS-1 seat, lay out the drogue parachute assembly on the packing table, stretch the drogue canopy and risers full length on the packing table with the canopy gore containing "THIS SIDE OUT" marking facing up.

Separate the suspension lines at the canopy skirt hem into two equal groups, one on each side of the top gore.

Separate the risers into two groups with the short risers positioned on top of the long risers and with the ends of the leather riser buffers


CONTAINER
FIXTURE
FIXTURE DOOR
END OF RISER SLEEVES
SHORT RISERS
RISER RETAINING CABLES
TURNBUCKLES
LONG RISERS

PR.478

Figure 21-25.--Drogue container positioned inside the packing fixture.

alined evenly. The suspension lines must run free from the skirt hem to the risers; remove any tangles or twists.

Place the drogue container in the packing fixture so that the hinged door of the container is positioned at the door of the packing fixture. Insure that the drogue container is clean and dry. Position the packing fixture under the risers so that the drogue container is positioned at the edge of the leather risers buffers. (See fig. 21-25.) Route the risers through the slots at the rear top of the container.

Close the packing fixture door, rotate the drogue canopy 180 degrees over the packing fixture and position the canopy on top of the leather covered portions of the risers. (See fig. 21-26.)

Place the canopy peak in the container, forward of the tube. Tuck the remainder of the canopy into the container in a semicircle around the tube. Do not fold or wrap the canopy around the tube.

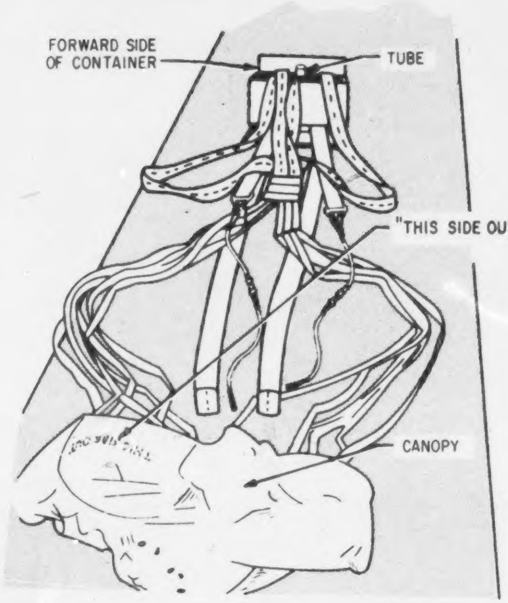
Accordion fold the suspension lines on the right side, across the forward portion of the container. Accordion fold the suspension lines on the left side, across the rear portion of the container. Place the riser confluence point at the forward, left corner of the container, on top of the suspension lines.

Remove any twists from the risers and accordion fold them into the left and right sides of the container with the short risers positioned on the top. (See fig. 21-27.)

Place the lower plate onto the container and insert the drogue thruster into the tube as shown in figure 21-28.

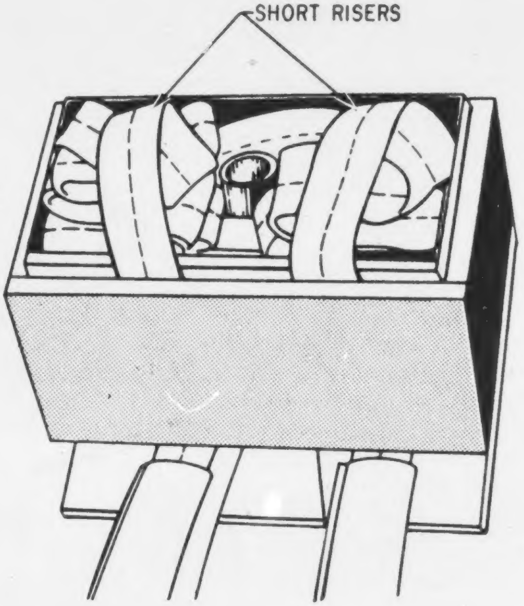
With the risers positioned in the container slots, carefully press the plate onto the container. (See fig. 21-29.)

Remove the container from the packing fixture and turn the container over. Install the washer and nut on the drogue thruster stud and



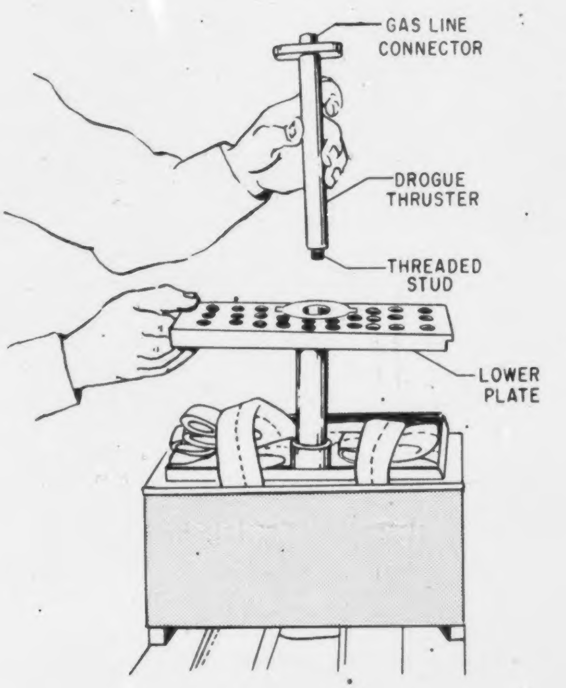
PR.479

Figure 21-26.–Drogue canopy rotated 180 degrees.

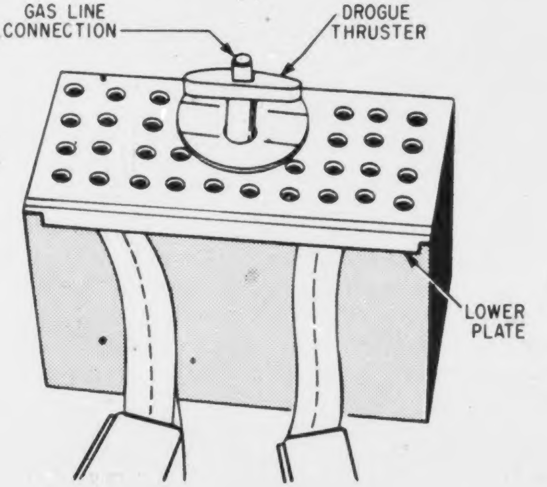


PR.480

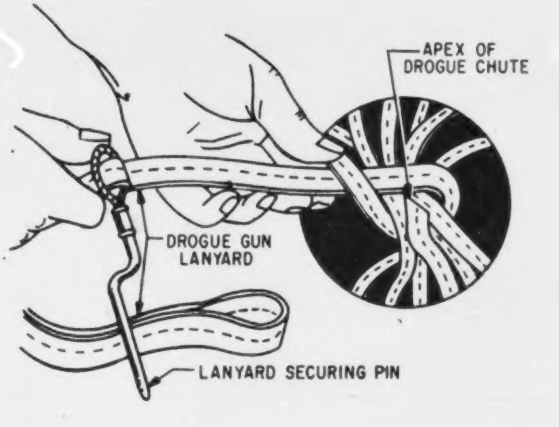
Figure 21-27.–Risers accordion folded into the container.


GAS LINE CONNECTOR
DROGUE THRUSTER
THREADED STUD
LOWER PLATE

PR.481
Figure 21-28.—Placing the lower plate onto the container.


GAS LINE CONNECTION
DROGUE THRUSTER
LOWER PLATE

PR.482
Figure 21-29.—Plate pressed onto the container.


APEX OF DROGUE CHUTE
DROGUE GUN LANYARD
LANYARD SECURING PIN

PR.483
Figure 21-30.—Drogue gun lanyard secured to the vent lines.

tighten. Install the drogue container in the ejection seat in accordance with the applicable Maintenance Instruction Manual.

To rig and pack the North American drogue parachute used in the LS-1 seat, lay out the drogue parachute assembly on the packing table. Stretch the drogue canopy and risers full length on the packing table with the canopy gore containing the manufacturer's nameplate facing up. Separate the suspension lines at the skirt hem into two equal groups on each side of the nameplate gore. Separate the risers into two groups with the long risers positioned on top of the short risers. The suspension lines must run free from the skirt hem to the risers. Remove any tangles or twists.

Pass the loop end of the drogue gun lanyard closest to the drogue container locking pin around the vent lines at the canopy peak. Pass the opposite end of the lanyard through the loop and pull tight, securing the lanyard to the vent lines, as shown in figure 21-30.

The helper must grasp each group of the suspension lines at the skirt hem and lift the drogue canopy, with the nameplate facing up, off the packing table. The packer must grasp each group of the risers, long risers on top of the short risers, and position them over the back of the ejection seat. The helper must position the drogue canopy in front of the seat.

Attach the long and short risers to the ejection seat roller on the back of the seat. Route each group of risers through the metal channels located on the rear side of the headrest.

With the helper holding the drogue canopy, nameplate up, in front of the ejection seat, the packer must accordion fold the left group of risers into the forward portion of the drogue container, until the confluence point is at the top of the drogue container. Lay the confluence point on top of the risers. The packer must accordion fold the right group of risers into the rear portion of the drogue container in the same manner.

Safety wire the risers and channels on all seats with ASC 88 incorporated, using 0.020-inch copper wire, as shown in figure 21-31.

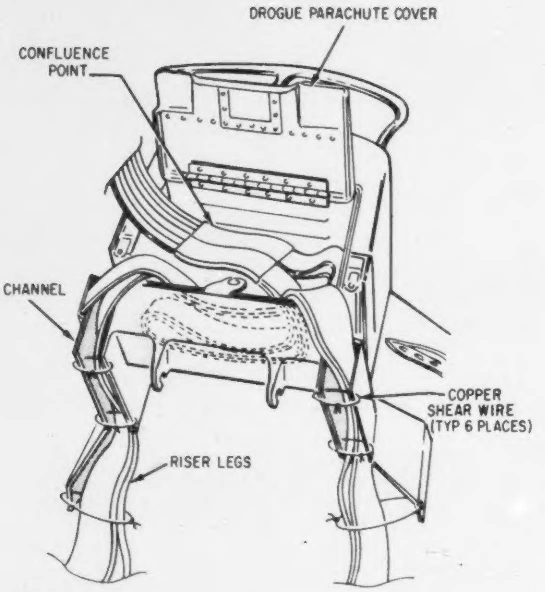
Remove all twists from each group of the suspension lines.

The helper must hold the drogue canopy above the ejection seat while the packer accordion folds the left group of suspension lines into the forward position of the drogue container, from left to right. The packer must accordion fold the right group of suspension lines into the rear portion of the drogue container in the same manner. The helper must lower the canopy, skirt hem first, into the drogue container. Do not accordion fold the canopy into the container.

The packer must press the canopy straight down into the container with the peak positioned on top, in the center.

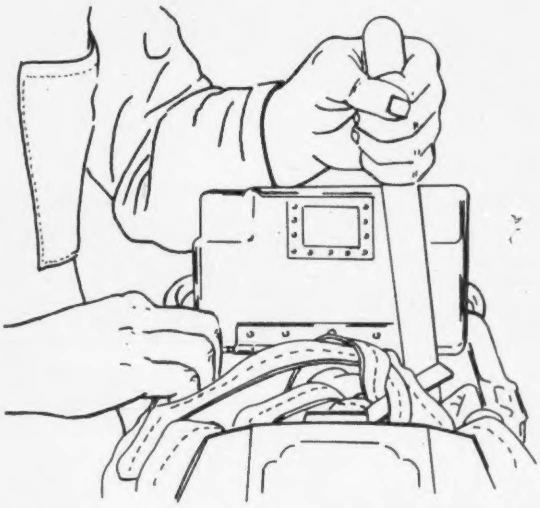
Tuck the canopy into the corners of the container using a 1-inch diameter round end dowel. (See fig. 21-32.)

Hold the container cover over the locking cone and insert the drogue gun lanyard locking pin. Safety tie the locking pin by looping a 12-inch length of size A nylon thread, single, under the pin. Tie off with four half-hitches.



PR.484

Figure 21-31.–Safety wiring risers and channels.



PR.485

Figure 21-32.–Tucking the canopy into the container corners.

Attach the loop in the end of the drogue gun lanyard to the drogue gun. Route the drogue gun lanyard through the channels on the rear, left side, of the headrest. Insert the two clear plastic strips into the channel to retain the lanyard in position. Fold the lanyard over the lanyard locking pin and snap the lanyard locking pin protective cover closed. The drogue gun lanyard must exit the protective cover at the left side.

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